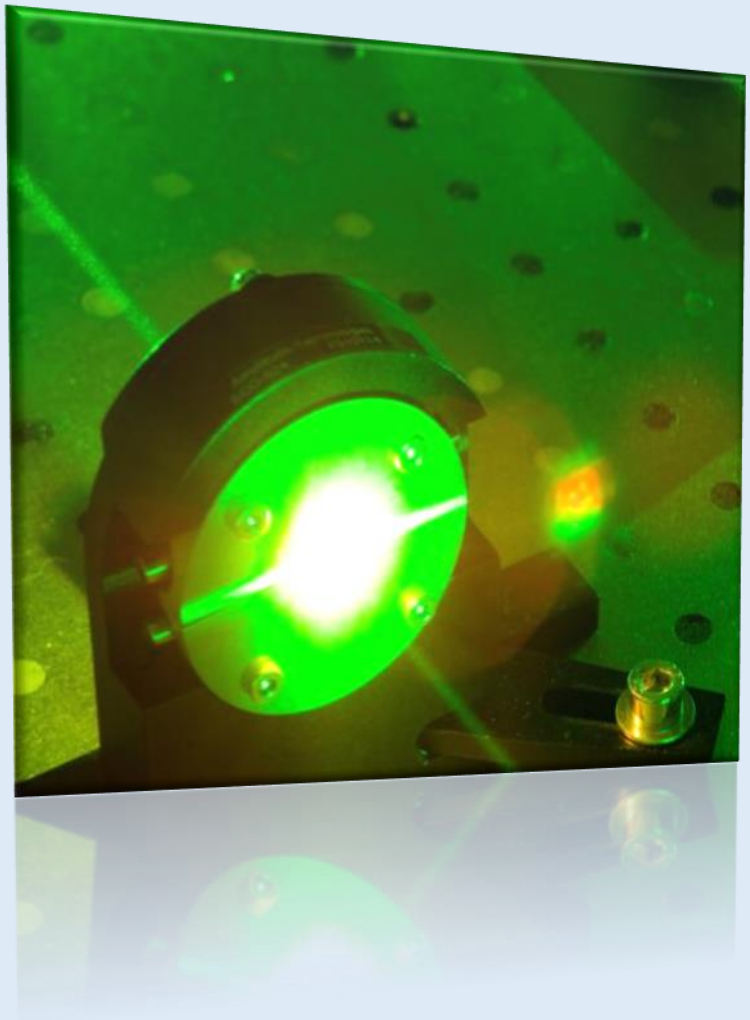
B3-VII
Department of
Nuclear and Atomic Physics
(DNAP)



Department of Nuclear and Atomic Physics

1. Name of the Department : Department of Nuclear and Atomic Physics (DNAP)

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 DNAP 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. Phil

   No students are admitted purely for an M.Phil programme. However, sometimes students in the Ph.D. and Integrated Ph.D. programmes are permitted to leave 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 DNAP 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 the five physics Departments in Colaba.

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

   A list of courses taught by DNAP faculty members outside TIFR in the period 2011 – 2015 follows.

	Institution	Course Name	Faculty member	Year
1.	CBS	Advanced Atomic Physics (PE1012)	L.C. Tribedi	2011
2.	CBS	Atomic Physics (PE 1003)	L.C. Tribedi	2012
3.	CBS	Lasers and Quantum Optics (PE 1003)	G. Ravindrakumar	2011
4.	CBS	Lasers and Quantum Optics (PE 1003)	G. Ravindrakumar	2012

	Institution	Course Name	Faculty member	Year
5.	CBS	Ultrashort Lasers & Modern Optics (PE 1009)	G. Ravindrakumar	2014
6.	CBS	Ultrashort Lasers & Modern Optics (PE 1009)	G. Ravindrakumar	2015
7.	CBS	Techniques of Modern Physics	V. Nanal	2011
8.	CBS	Advanced Atomic Physics (PE1012)	L.C. Tribedi	2015
9.	CBS	Atomic Physics	L.C. Tribedi	2013
10.	CBS	Atomic Physics (PE 1003)	L.C. Tribedi	2012
11.	CBS	Modern Techniques	L.C. Tribedi	2011

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 DNAP 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, DNAP 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 Atomic, Molecular and Nuclear Physics, as well as Laser Optics.

DNAP 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 (Item 11)	Number
1.	Distinguished Professor (J)	Dist. Professor (J)	1
2.	Senior Professor (I)	Sr. Professor (I)	3
3.	Professor (H)	—	5
4.	Associate Professor (G)	Assoc. Professor (G)	4
5.	Reader (F)	—	2
6.	Fellow (E)	—	—
		Total	**15**

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

	Name	Deg*	Designation	Specialisation	Exp†	Stu‡
1.	Deppak Mathur	Ph.D	Dist. Professor (J)	Atomic, Molecular & Optical Physics	35	2
2.	R.G. Pillay	Ph.D.	Sr. Professor (I)	Nuclear and Accelerator physics Condensed Matter Physics Neutrino Physics	41	2
3.	E. Krishnakumar	Ph.D	Sr. Professor (I)	Atomic, Molecular & Optical Physics	25	5
4.	G. Ravindrakumar	Ph.D	Sr. Professor (I)	Atomic, Molecular & Optical Physics	25	6
5.	S.N. Mishra	Ph.D	Professor (H)	Nuclear Condensed Matter Physics	30	1
6.	S.V.K. Kumar	Ph.D.	Professor (H)	Atomic, Molecular & Optical Physics	22	—
7.	Lokesh C. Tribedi	Ph.D.	Professor (H)	Atomic and Molecular Collision Physics	22	7
8.	Vandana Nanal	Ph.D	Professor (H)	Nuclear, Neutrino & Accelerator Physics	18	5
9.	M. Krishnamurthy	Ph.D	Professor (H)	Atomic, Molecular & Optical Physics	16	4
10.	Indranil Mazumdar	Ph.D	Professor (H)	Nuclear Physics	15	1
11.	Subrata Pal	Ph.D.	Assoc. Professor (G)	Theoretical Nuclear Physics	15	2
12.	Rudrajyoti Palit	Ph.D	Assoc. Professor (G)	Nuclear Physics	12	5
13.	Sushil Mujumdar	Ph.D	Assoc. Professor (G)	Optics	9	4
14.	Deepankar Misra	Ph.D	Reader (F)	Atomic and Molecular Collisions	5	1
15.	V. Prabhudesai	Ph.D	Reader (F)	Atomic, Molecular & Optical Physics	5	1

* 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

DNAP does not employ temporary faculty.

14. Programme-wise Student Teacher Ratio

	Programme	Students (S)	Faculty (F)	Ratio S/F
1.	Ph.D.	13	15	0.9
2.	Integrated M.Sc.-Ph.D.	11	15	0.7
3.	M.Sc.	–	–	–

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

Scientific and Technical Staff	Administrative and Auxiliary Staff	Total
22	1	23

16. Research thrust areas as recognized by major funding agencies

- Nuclear Physics and allied interdisciplinary sciences
- Atomic and molecular physics, electron-induced Chemistry
- Accelerator-based atomic collision physics
- Laser –Matter Interactions, Photonics and Nano-optics

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	Tot. Grant (Rs. lakhs)	Duration (years)	Faculty member
1.	PSA-GOI	Fabrication & submicron tailoring of materials for photonics applications with ultrafast lasers	3,63.85	5	D. Mathur
2.	DST	Giant dipole resonance decay from hot rotating nuclei	1,37.00	7	I. Mazumdar
3.	DST	Interaction of size limited matter in intense laser fields	1,12.25	7	M. Krishnamurthy
4.	DAE	Set-up a scanning near-field optical microscope	1,09.57	6	S. A. Mujumdar
5.	DST	Swarnajayanti fellowship	103.00	5	L.C. Tribedi
6.	UGC	Triggering and guiding of lighting by plasma filaments induced by high power femtosecond laser	89.70	3	G. Ravindrakumar
7.	DST	Swarnajayanti fellowship	72.85	5	S. A. Mujumdar
8.	SERB	J. C. Bose fellowship	65.50	10	D. Mathur
9.	SERB	Studies of exotic nuclei under extreme conditions using a	63.99	11	R. Palit
10.	DST	J. C. Bose fellowship	60.80	6	G. Ravindrakumar
11.	DST	Ramanujan fellowship	28.20	6	S. A. Mujumdar
12.	DST	Femtosecond laser micromachining transparent solids.	17.72	4	D. Mathur
13.	DAE	Preoperative programme for Indian participation in the FAI project at GSI, Germany - acc & detector related R&D	16.97	6	R. Palit
14.	DST	Resonators in nearly-periodic nanostructured semiconductors	2.18	2	S. A. Mujumdar
15.	DST	Application of fast electrons produced in ultrahigh intensity laser-matter interactions	1.01	4	G. Ravindrakumar

International

	Agency	Project Title	Tot. Grant (Rs. lakhs)	Duration	Faculty
1.	Max-Plank-Gesellschaft	Partner group for laser science	7.53	5	M. Krishnamurthy
2.	Observatorie de Paris, France	Support at the virtual atomic & molecular data centre	31.33	4	E. Krishnakumar

18. Inter-institutional collaborative projects and associated grants received

(a) National

	Collaborating Institutions	Project Title	Total Grant (Rs. lakhs)	Duration	Faculty
1.	Manipal University	Raman Tweezers	69.00 (DBT)	3 years	D. Mathur
2.	BARC	Improvements to the Pelletron Linac Facility (DAE funded)	1500	2012-17	Common facility
3.	BARC, IIT Ropar, Univ. of Lucknow, VECC	Prototype development of cryogenic bolometer for Neutrinoless Double beta decay (DAE funded)	550	2012-17	Vandana Nanal, R. G. Pillay

(b) International

	Collaborating Institutions	Project Title	Total Grant (Rs. lakhs)	Duration	Faculty
1.	Imperial College London	Optical science and technology	11.00 (Erasmus-Mundus, European Union)	2 years	D. Mathur
2.	BARC, VECC, Univ. of Delhi FAIR (GSI, Germany) and SPIRAL2 (GANIL, France) and others	Experimental at International RIB Facilities(EXRIB) DAE – DST funded	400	2012-17	Vandana Nanal, R. Palit, R. G. Pillay
3.	Hebrew University,	Lightening control using lasers	190	2014 – 2018	G. Ravindra

	Jerusalem, Israel				Kumar

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	XII Plan Project – Nuclear Physics (2 projects)	876	2012 – 2017	All Nuclear physics faculty
2.	DAE	XII Plan Project – Nuclear Physics (6 projects)	2385	2012 – 2017	All atomic physics faculty

20. Research facility / centre with

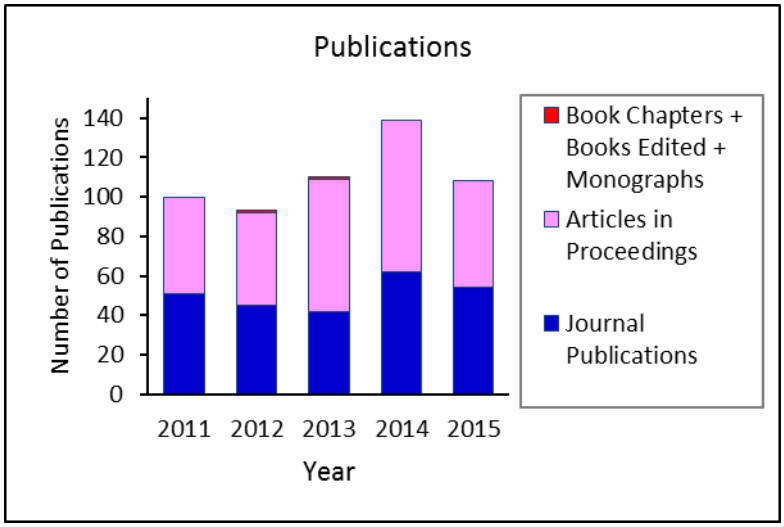
- state recognition :
- national recognition : Pelletron-LINAC Facility
- international recognition :

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

At present, there are none such in the DNAP.

22. Publications:

DNAP	Journal Publications	Articles in Proceedings	Technical Reports	Web Publications	Book Chapters	Books Edited	Mono-graphs
2010-11	51	49	—	—	—	—	—
2011-12	45	47	—	—	1	—	—
2012-13	42	67	—	—	1	—	—
2013-14	62	77	—	—	—	1	—
2014-15	54	54	—	—	—	1	—
Total	**254**	**294**	—	—	**2**	2	—



* Books with ISBN with details of publishers : None

* Citation Index :

  Total number of citations: 25035

  Number of citations per faculty: 1669

* h-index

  Range: 11 – 36

23. Details of patents and income generated

	Patent Holder	Patent Name	Patent No	Date	Income
1.	M. Krishnamurthy G. Ravindra Kumar K. Ray (DBS)	Laser Plasma from Biological Targets as X-ray Point Source	PCT/IN2009 /000632	2011	—

24. Areas of consultancy and income generated

DNAP 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	Location	Year
1.	R. Palit	Utkal University, Bhubaneswar.	Bhubaneswar	2015
2.	R. Palit	VECC Kolkata	Kolkata	2015
3.	E. Krishnakumar	University of Delhi	New Delhi	2015
4.	S. Mujumdar	Benaras Hindu University	Varanasi	2015
5.	S. Mujumdar	IISc	Bengaluru	2014
6.	R. Palit	Panjab University, Chandigarh.	Chandigarh	2014
7.	V. Nanal	IIT –Guwahati.	Guwahati	2014
8.	S. Mujumdar	University of Hyderabad	Hyderabad	2014
9.	R. Palit	VECC, Kolkata.	Kolkata	2014
10.	R. Palit	VECC, Kolkata	Kolkata	2014
11.	L.C. Tribedi	VECC Kolkata.	Kolkata	2014
12.	I. Mazumdar	IUAC, New Delhi.	New Delhi	2014
13.	S. Mujumdar	SSIHL, Puttaparthi.	Puttaparthi	2014
14.	I. Mazumdar	IIST, Trivandrum	Trivandrum	2014
15.	I. Mazumdar	IIST, Trivandrum.	Trivandrum	2014
16.	M. Krishnamurthy	Panjab University	Chandigarh	2013
17.	L.C. Tribedi	Karnataka University	Dharwad	2013
18.	E. Krishnakumar	IPR Gandhinagar	Gandhinagar	2013
19.	L.C. Tribedi	IPR, Gandhinagar.	Gandhinagar	2013
20.	M. Krishnamurthy	LPAW, Goa.	Goa	2013
21.	S. Mujumdar	RRCAT	Indore	2013
22.	L.C. Tribedi	IACS, Jadavpur.	Jadavpur	2013
23.	R.G. Pillay	IGCAR	Kalpakkam	2013
24.	V. Nanal	VECC, Kolkata.	Kolkata	2013
25.	L.C. Tribedi	RKM College, Narendrapur	Kolkata	2013
26.	I. Mazumdar	VECC, Kolkata.	Kolkata	2013
27.	V. Nanal	Kamraj University	Madurai	2013
28.	I. Mazumdar	IUAC, New Delhi.	New Delhi	2013
29.	R. Palit	Sambalpur University	Sambalpur	2013
30.	E. Krishnakumar	Sardar Patel University,.	Vallabh Vidya Nagar	2013
31.	L.C. Tribedi	Sardar Patel University	Vallabh Vidyanagar	2013
32.	G.Ravindra Kumar	PRL, Ahmedabad.	Ahmedabad	2012
33.	G.Ravindra Kumar	IISc, Bengaluru.	Bengaluru	2012

34.	S. Mujumdar	IISc	Bengaluru	2012
35.	S. Mujumdar	DAE-BRNS National Laser Symposium-20, Anna University	Chennai	2012
36.	M. Krishnamurthy	IIT Madras	Chennai	2012
37.	R. Pali	Chitkara University	Himachal Pradesh	2012
38.	E. Krishnakumar	University of Hyderabad	Hyderabad	2012
39.	M. Krishnamurthy	University of Hyderabad	Hyderabad	2012
40.	E. Krishnakumar	RRCAT Indore	Indore	2012
41.	E. Krishnakumar	IISER Kolkata.	Kolkata	2012
42.	R. Palit	VECC, Kolkata.	Kolkata	2012
43.	L.C. Tribedi	IISER-Kolkata.	Kolkata	2012
44.	L.C. Tribedi	VECC Kolkatta,	Kolkata	2012
45.	S. Mujumdar	Central Glass and Ceramic Research Inst.	Kolkata	2012
46.	S. Pal	SINP Kolkata	Kolkata	2012
47.	R. Palit	IUAC, New Delhi.	New Delhi	2012
48.	L.C. Tribedi	IUAC Delhi.	New Delhi	2012
49.	L.C. Tribedi	IIT, Roorkee.	Roorkee	2012
50.	G.Ravindra Kumar	JNCASR, Bengaluru.	Bengaluru	2011
51.	V. Nanal	NUINT, Dehradun .	Dehradun	2011
52.	S. Mujumdar	IIT Delhi.	Delhi	2011
53.	E. Krishnakumar	Karnataka University	Dharwad	2011
54.	S. Mujumdar	Hyderabad Central University.	Hyderabad	2011
55.	G.Ravindra Kumar	IISER Kolkata.	Kolkata	2011
56.	L.C. Tribedi	SINP, Kolkata.	Kolkata	2011
57.	L.C. Tribedi	IACS, Jadavpur, Kolkata.	Kolkata	2011
58.	V. Nanal	Kamraj University	Madurai	2011
59.	R.G. Pillay	IUAC, New Delhi	New Delhi	2011
60.	L.C. Tribedi	Delhi University	New Delhi	2011
61.	S. Mujumdar	IIT Delhi.	New Delhi	2011
62.	M. Krishnamurthy	PLASMA-2011	Patna	2011
63.	G.Ravindra Kumar	RRCAT, Indore.	Indore	2010
64.	S. Mujumdar	RRCAT, Indore.	Indore	2010
65.	R.G. Pillay	IIT Kharagpur.	Kharagpur	2010
66.	L.C. Tribedi	VECC, Kolkata.	Kolkata	2010
67.	L.C. Tribedi	SINP Kolkata.	Kolkata	2010
68.	L.C. Tribedi	IUCAA, Pune	March 22nd 2010	2010
69.	V. Nanal	BITS, Pilani.	Pilani	2010
70.	R. Palit	BITS Pillani	Pillani	2010

International Visits :

	Faculty Member	Institution visited	Country	Year
1.	L.C. Tribedi	U. of Toulouse	France	2015
2.	L.C. Tribedi	CIRIL Lab., GANIL Accelerator, Caen	France	2015
3.	L.C. Tribedi	CSIC, Insti. de Fisica Fundamental, Madrid	Spain	2015
4.	L.C. Tribedi	U. of Toulouse	France	2014
5.	S. Pal	Insti. de Physique Theorique (IPhT), Saclay	France	2014
6.	S. Pal	Frankfurt Inst. for Advanced Studies (FIAS)	Germany	2014
7.	S.V.K. Kumar	University of Potsdam	Germany	2014
8.	E. Krishnakumar	Open University, Milton Keynes	UK	2014
9.	S. Mujumdar	Thales Research and Technology, Palaiseau	France	2013
10.	S.V.K. Kumar	CiMAP, GANIL, Caen	France	2013
11.	E. Krishnakumar	MPI for Biophysical Chemistry, Gottingen	Germany	2013
12.	R. Palit	University of Wurzburg	Germany	2013
13.	R. Palit	Physikzentrum Bad Honnef	Germany	2013
14.	S. Mujumdar	Physikzentrum, Bad Honnef	Germany	2013
15.	S. Mujumdar	University of Würzburg	Germany	2013
16.	E. Krishnakumar	ICTP Trieste	Italy	2013
17.	S. Mujumdar	AS-ICTP, Trieste	Italy	2013
18.	E. Krishnakumar	Open University, Milton Keynes	UK	2013
19.	E. Krishnakumar	University of Durham	UK	2013
20.	I. Mazumdar	Notre Dame University	USA	2013
21.	L.C. Tribedi	Aarhus University	Denmark	2012
22.	S. Pal	Frankfurt Inst. for Advanced Studies (FIAS)	Germany	2012
23.	E. Krishnakumar	Iceland University, Iceland	Iceland	2012
24.	E. Krishnakumar	Open University, Milton Keynes	UK	2012
25.	S.V.K. Kumar	Open University, Milton Keynes	UK	2012
26.	I. Mazumdar	Ohio University	USA	2012
27.	I. Mazumdar	Jefferson Lab	USA	2012
28.	R. Palit	Notre Dame University	USA	2012
29.	I. Mazumdar	IPNO, Orsay, Paris	France	2011
30.	S. Mujumdar	Max Planck Institute for Science of Light	Germany	2011
31.	S. Pal	Frankfurt Inst. for Advanced Studies (FIAS)	Germany	2011
32.	S.V.K. Kumar	Max Plank Institut für Kern Physik	Germany	2011
33.	S.V.K. Kumar	GSI, Darmstadt	Germany	2011

34.	E. Krishnakumar	Maynooth University, Dublin	Ireland	2011
35.	I. Mazumdar	RIKEN	Japan	2011
36.	R. Palit	RIKEN	Japan	2011
37.	I. Mazumdar	KVI, Groningen	Netherlands	2011
38.	S.V.K. Kumar	KVI,Groningen	Netherlands	2011
39.	I. Mazumdar	Bogoliubov Inst.of Theoretical Physics, JINR	Russia	2011
40.	E. Krishnakumar	Open University, Milton Keynes	UK	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.	E. Krishnakumar	Indian Academy of Sciences, Bangalore	Fellow	2008 –
		Executive Committee of Indian Society of Atomic and Molecular Physics	Member	2014-16
		Council of Management of DAE-UGC Consortium for Scientific Research	Member	2012 –
		Council of Management of Homi Bhabha Centre for Science Education	Member	2012 –
		DST Programme advisory committee on Lasers, Optics, and Atomic and Molecular Physics	Member	2012-15
2.	D. Mathur	INSA Council	Member	3 yrs
		SAC-Cabinet	Invited Member	1 yr
		National IUPAP Committee	Chair	4 yrs
		INSPIRE Faculty Awards Committee	Chair	4 yrs
		Academic Committee,10th International Junior Science Olympiad	Chair	1 yrs
		International Review Committee for DRDO Advanced Centre for High Energy Materials, Hyderabad	Chair	1 yr
		Review Committee for the DRDO Centre at IIT-M	Chair	1 yr
		Research Council, DRDO's LASTEC, New Delhi	Chair	3 yrs
3.	I. Mazumdar	Organizing committee DAE-BRNS Annual Nuclear Physics Symposium	Member	2011-
4.	V. S.Nanal	DST WOS-A committee	Member	3 yrs

	Name of the Faculty Member	Name of the Committee	Role in the Committee	Term of Service
		DST-SERB PAC (Physical sciences)	Member	3 yrs
5.	R. Palit	Organizing Committee of Nuclear Physics Symposium	Member	2012-2015
		Organizing Committee of Frontiers in Gamma ray Spectroscopy, VECC, Kolkata	Member	2015
		Organizing committee of the workshop on "Recent trends in nuclear structure and its implication in astrophysics"	Member	2016
6.	R. G. Pillay	DAE-DST mega science co-ordination committee	Member	3 yrs
		DAE-SG group (accelerator & laser science)	Member	4 yrs
		DAE-SG group (DAE projects)	Member	4 yrs
		VECC Council	Member	4 yrs
		Faculty Selection Committee IIT Ropar	Member	2009-
		Faculty Selection Committee SINP	Member	2011-
		School of Physics Board, University of Hyderabad	Member	3 yrs
7.	V.S. Prabhudesai	Executive Committee of Indian Society for Atomic and Molecular Physics	Treasurer	2012 - 2016
8.	G.Ravindrakumar	Chancellor's nominee for selection and promotion of faculty at Jadavpur University	Member	2014 –
		Chancellor's nominee for selection and promotion of faculty at Kolkata University	Member	2014 –
		Chancellor's nominee for selection and promotion of faculty at Kalyani University	Member	2014 –
		Faculty Selection Committee, IISER Pune	Member	2012-
		Faculty Selection Committee, IISER Bhopal	Member	2014-
9.	L. C. Tribedi	Organizing committee member of National Conference of Atomic and Molecular Physics (NCAMP), at IIST, Trivandrum	Co-convener	2014
		Convener SPARC (Stored particle atomic reaction collaboration) India Workshop	Convener	2014
		Convener, workshop on highly charged ions (WHCI), TIFR	Convener	2012
		DST-SERC School at TIFR	Course director	2013
		Atomic Processes in Plasmas	Co-convener	2013
		Executive committee of Ion-Beam Society of India, IUAC, Delhi	Members	2012 –
		Executive Committee of Indian Society of	Vice-	2012-

	Name of the Faculty Member	Name of the Committee	Role in the Committee	Term of Service
		Atomic and Molecular Physics ISAMP	president	2014
		Executive Committee of Indian Society of Atomic and Molecular Physics ISAMP	President	2014 –

(b) International Committees :

	Name of the Faculty Member	Name of the Committee	Role of the Committee	Term of Service
1.	E. Krishnakumar	International Advisory Committee, Asian International Seminar on Atomic and Molecular Physics	Member	2006 –
		European Programme on Electron Controlled Chemical Lithography	Member	2010-12
		International Advisory Committee for Electron-Molecule Symposium	Member	2011-13
		Virtual Atomic and Molecular Data Centre (VAMDC)	Board member	2013 –
		International Advisory Committee for Electron-Molecule Symposium	Chair	2013-15
2.	D. Mathur	IUPAP Commission, C-15	Vice-Chair	3 years
		Asian Intense Laser Network	Co-Chair	12 years
		International Committee, Asian Laser Centre, Gwangju, Korea	Member	5 years
		10th International Symposium on Ultrafast Intense Laser Science, Eisenach	Co-Chair	1 year
		12th International Symposium on Ultrafast Intense Laser Science, Salamanca	Chair	1 year
		13th International Symposium on Ultrafast Intense Laser Science, Jodhpur	Chair	1 year
3.	I. Mazumdar	Management Board, International PARIS collaboration	Member	2014 –
		International Advisory Committee,	Member	2015

	Name of the Faculty Member	Name of the Committee	Role of the Committee	Term of Service
		21st International conference on Few -Body Physics, Chicago		
4.	S. N. Mishra	International Advisory committee for Hyperfine Interactions	Member	1 yr
5.	V. S. Nanal	PARIS Collaboration Steering committee	Co-chair	2 yrs
		PARIS Collaboration Steering committee	Chair	2 yrs
6.	R. Palit	DEGAS Collaboration for HISPEC/DESPEC experiments at FAIR	Project Leader	2012-
		International Advisory Committee on Nuclear Structure 2016, Oak Ridge National Lab, Tennesse, USA	Member	2016
		International Advisory Committee on Nuclear Structure 2012, Arognne National Lab, Chicago, USA	Member	2012
		Joint International Advisory and Programme committee of 2nd International Conference on Dosimetry and its Applications (ICDA2)', 3 - 8 July 2016, University of Surrey, UK	Member	2016
7.	R. G. Pillay	Indo-France LIA	Scientific coordinator	4 yrs
8.	G. Ravindrakumar	International Committee on Ultra high intensity lasers	Member	2007 –
		Board for conferences on inertial fusion science and application	Member	2007 –
		International Conference on Ultrahigh Intensity Lasers 2014	Co-Chair	2014
		Programme committee, Series of International conferences High Energy Density Science, Yokohama, Japan	Member	
		Programme Committee, Series of CHILI international conferences, Tel Aviv	Member	
9.	L. C. Tribedi	General Committee of International	Member	2011-

	Name of the Faculty Member	Name of the Committee	Role of the Committee	Term of Service
		Conference on the Physics of Electronic and Atomic Collisions (ICPEAC) - Lanzhou, China 2013 & Toledo-Spain 2015		15
		International advisory body, MPS conference	Represents India	2014
		International committee of SHIMEC. "Swift Heavy ions in Materials Engineering and Characterization", IUAC, Delhi	Member	2014
		International governing body of the SPARC collaboration, GSI	Member	2007 -
		International advisory committee for the ISIAC (International Symposium on Ion-atom Collisions)	Member	2005 –
		International advisory board, International conference on highly charged ions(HCI)	Member	2010 –

(c) Editorial Boards :

	Name of the Faculty Member	Name of the Journal	Impact Factor	Term of Service
1	D. Mathur	Journal of Physics B	1.98	3 yrs
		EPL (Europhysics Letters)	2.27	5 yrs
		Rapid Communications in Mass Spectrometry	2.25	15 yrs
2	E. Krishnakumar	International Advisory Board, Journal of Physics B: Atomic, Molecular and Optical Physics	1.98	2016 –2019
3	I. Mazumdar	National Science Journal PRAMANA	0.65	2014 –
4	G.Ravindrakumar	National Science Journal PRAMANA	0.65	2008 –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

National Awards

	Awardee	Name of the Award/Honour	Year
1.	S. Mujumdar	Scopus Young Scientist Award (Physics) of the NASI	2014
2.	S. Mujumdar	Swarnajayanti Fellowship of the DST	2013
3.	S. Mujumdar	Ramanujam Fellowship of the DST	2010
4.	G. Ravindrakumar	Infosys Prize	2015
5.	G. Ravindrakumar	J.C. Bose Fellowship of the DST	2011
6.	G. Ravindrakumar	S.S. Bhatnagar Award of the CSIR	2003
7.	G. Ravindrakumar	B.M. Birla Prize	2000
8.	M. Krishnamurthy	Swarnajayanti Fellowship of the DST	2008
9.	M. Krishnamurthy	B. M. Birla Prize	2003
10.	V. Prabhudesai	INSA Medal for Young Scientist	2008

11.	I. Mazumdar	Swarnajayanti Fellowship of the DST	2007
12.	D. Misra	INSA Medal for Young Scientist	2011
13.	D. Mathur	Bhatnagar Prize, CSIR	1991
14.	D. Mathur	N S Sathyamurthy Prize, Indian Physics Association	1986
15.	D. Mathur	Fellow of the Indian Academy of Sciences	1992
16.	D. Mathur	Eminent Mass Spectrometrist Prize, ISMAS	1996
17.	D. Mathur	Fellow of the Indian National Science Academy	1999
18.	D. Mathur	C V Raman Lectureship, DAE	2003
19.	L.C. Tribedi	Swarnajayanti Fellowship, DST	2003
20.	L.C. Tribedi	Goyal Young Scientist Prize	2005
21.	L.C. Tribedi	INSA Young Scientist Award	1994

International Awards

	Awardee	Name of the Award/Honour	Year
1.	D. Mathur	TWAS Fellow	2013
2.	D. Mathur	European Union's Erasmus-Mundus Scholar in Optical Science and Technology	2008-2010

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

National Awards

	Awardee	Name of the Award/Honour	Year
1.	Amit D. Lad	"Pervez Guzdar Young Scientist Award 2014" for his outstanding research contributions in the field of Intense Laser Matter Interactions, by the Plasma Science Society of India (PSSI)	2014

International Awards

	Awardee	Name of the Award/Honour	Year
1.	K. Dota (Ms.)	"3rd International Symposium on Ultra-fast Intense Laser Science Award" for Young Researchers by the University of Tokyo, Japan	2012
2.	Prashant K. Singh	Best poster award entitled "Observation of Oscillations in the Plasma Critical Surface" at the ICTP-IAEA College on Plasma Physics, Trieste, Italy	2012
3.	Anjani K. Tiwari	OSA (Optical Society of America) Best Student Paper Prize" at the "Photonics 2012 - International Conference on Fiber Optics and Photonics", IIT, Chennai	2013
4.	Amitava Adak	Best Poster in Inertial Fusion Sciences and	2013

		Applications, Seattle, USA	

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

	Year	Name	Funding	Faculty members
1.	2015	Indo-french Collaboration meeting	TIFR	Vandana Nanal
2.	2014	DST-SERC School on Nuclear structure at High Angular Momentum and Isospin	DST	Indranil Mazumdar, R. Palit
3.	2014	International Conference on Ultra-Intense Lasers (ICUIL)	Registration	G Ravindra Kumar, M. Krishnamurthy
4.	2014	Conference of Asian Core Program for High Energy Density Science Using Strong Laser Photons (ASHULA)	JSPS	G Ravindra Kumar, M. Krishnamurthy
5.	2014	SPARC-India Workshop	TIFR	Lokesh Tribedi, Vaibhav Prabhudesai, Deepankar Misra
6.	2013	1st VAMDC India meeting	EU	E Krishnakumar, Vaibhav Prabhudesai
7.	2013	PARIS India Collaboration meeting	TIFR	Vandana Nanal, R Palit, R G Pillay
8.	2013	DST-SERC School on Physics of Highly Charged Ions	DST	Lokesh Tribedi, Vaibhav Prabhudesai, Deepankar Misra
9.	2012	Workshop on Highly Charged Ions and Atomic Collisions	TIFR	Lokesh Tribedi, Vaibhav Prabhudesai, Deepankar Misra
10.	2011	India-NUSTAR Meeting	TIFR	R. G. Pillay, Vandana Nanal, R. Palit
11.	2011	Advances in Nuclear Physics (ANUP11)	ICTS	Vandana Nanal
12.	2010	Nucleon-Nucleon Interaction Workshop	ICTS	Indranil Mazumdar

31. Code of ethics for research followed by the departments

See Annexure B2-B for a detailed document which is applicable across TIFR Departments and Centres.

32. Student profile programme-wise:

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

Name of the Programme	Applications Recd	Selected		Joined		Pass percentage*	
		Male	Female	Male	Female	Male	Female
Ph.D.	21370	31	5	17	3	76	100
Integrated M.Sc.-Ph.D.		14	1	6	-	83	-

33. Diversity of students

(a) Geographic

Students	Ph.D.		Integrated-Ph.D.		M.Sc.		Total
	Male	Female	Male	Female	Male	Female	
From the state where the university is located	2	0	0	0	—	—	**2**
From other states of India	9	2	10	2	—	—	**23**
NRI students	—	—	—	—	—	—	**—**
Total	**12**	**1**	**10**	**2**	**—**	**—**	**25**

(b) Graduate Institution

	Ph.D.		Integrated M.Sc.-Ph.D.		M.Sc.		
	Male	Female	Male	Female	Male	Female	**Total**
From Universities	2	1	10	2	0	0	**15**
From premier science institutions †	0	0	0	0	0	0	**0**
From premier professional institutions #	9	1	0	0	0	0	**10**
From others*	0	0	0	0	0	0	**0**
Total	**11**	**2**	**10**	**2**	**0**	**0**	**25**

† 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	12
2.	GATE	9
3.	JEST	9
4.	Other	6

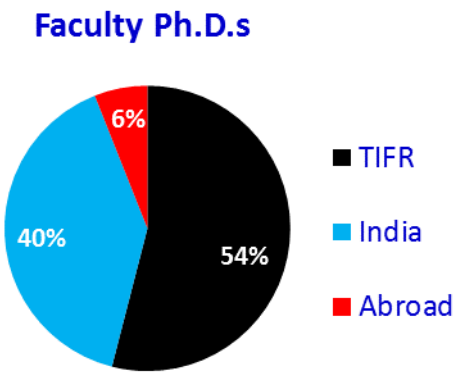
35. Student progression

- Ph.D. programme : Most of the students admitted to the DNAP 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 DNAP 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 :	8
from other institutions in India :	6
from institutions Abroad:	1
Total :	**15**



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 question is not relevant.

38. Present details of departmental infrastructural facilities with regard to

a) Library

DNAP, 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

DNAP, 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

DNAP, 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 DNAP (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.	Molecular dynamics and control Laboratory	2	0	3	Study of low energy molecule interactions and study of coherent control of molecules using shaped ultrashort laser pulses
2.	High energy gamma ray lab.	1	2	1	Study of structure and reaction of hot and rotating nuclei.
3.	Hyperfine Interaction Laboratory	4	2	1	Investigation of solid state phenomena at short length and time scales using hyperfine interaction as a probe
4.	Accelerator Based Atomic Physics.	2	1	6	Bent crystal based high resolution x-ray spectrometer, continuum electron spectrometer and ToF setups are used to study the collective excitation in large molecules, clusters, ionization of biomolecules, PAH molecules and Young type interference effect
5.	ECR Ion Accelerator	2	1	6	ECR-based Ion accelerator lab with 4 beam lines; electron spectrometer based setups Time-of-Flight recoil ion spectrometers for dealing with fundamental problems on atomic and molecular collision physics
6.	Fast electron collision laboratory	2	1	6	Young type electron interference in molecular double slit using O_2 and N_2 Ionization and fragmentation of

					biomolecules
7.	Nano-optics and Mesoscopic Optics Laboratory	1	2	2	We study exotic phenomena in condensed matter studied using optical means. One of the subfields involves the study of amplifying random media, called 'random lasers'. Further, we carry out experimental investigation of Anderson Localization in one-dimensional and two-dimensional systems. These experiments are complemented with near-field microscopic studies of disordered systems.
8.	NDBD lab	2	1	3	R&D on superconducting Tin bolometer to search for NDBD in 124Sn
9.	Study of GDR in hot nuclei	2	1	1	Study of nuclear shapes at high T and J, study of collective excitations using radioactive ion beam
10	PLF accelerator facility	2	1	0	A joint TIFR-BARC facility , operated round the clock For about 100 users. Research output of facility is around ~25 Ph.D and more than 100 publications in last 5 years
11	Discrete Gamma Spectroscopy	1	2	3	We investigate the low energy response of atomic nuclei to rotational stress using a powerful "femtoscope" consisting of segmented high purity Germanium detectors. The nuclei are prepared in excited states (with 10^{21} rotations per second) using energetic beams from the heavy ion accelerators. The fast rotating nucleus decays to its ground state, through the intermediate excited states, emitting copious gamma rays that are measured by the femtoscope. By casting the nuclei to various shapes and studying their decays, the emergent properties of complex nuclear many-body system are

					elucidated.
12	Ultrashort pulse high intensity laser lab	2	2	6	Studying matter in extreme states using high power laser pulses

* 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.	Amitava Adak	1.	K. S. Alee
2.	Arnab Khan	2.	Indranuj Dey
3.	Angana Mondal	3.	Ketan Rathod
4.	Chandrodoy Chattopadhyay	4.	Susanta K Mohanta
5.	Chandan D. Bagdia	5.	Santosh Roy
6.	Chandan Ghosh	6.	Sudipta Saha
7.	Deep Sarkar	7.	Sreemoyee Sarkar
8.	Farhan S. Babra	8.	Neha Dokania
9.	Krishnendu Gope	9.	Arpit Ashok Rawankar
10.	Kamalesh Jana	10.	Purnima Singh
11.	Malay Dalui	11.	Arpita Nath
12.	Moniruzzaman Shaikh	12.	A. K. Rhine Kumar
13.	Vishvesh Ashok Tadsare	13.	A. K. Gourishetty
14.	Anjani Kumar Tiwari		
15.	Ravitej Uppu		
16.	Randhir Kumar		

JRFs		**SRFs**
1.	Juliah J. Chelliah	Kritika Dotta
2.	Madhusree Roy Chowdhury	
3.	Thupten Tsering	
4.	Ghnashyam R. Gupta	
5.	Sayan Basu	

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

ALL the students of DNAP (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.

DNAP, 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 Coodinator (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 (maximum 10)

	Name of the Alumnus	Reason for Distinction
1.	Raja Ramanna	Padma Vibhushan, Ex-Chairman, AEC, Ex-Union Minister of State for Defence, Founder Director ,NIAS, Bhatnagar Award
2.	P.K. Iyengar	Padma Bushan, Ex-Chairman, AEC, Bhatnagar Award
3.	Vijay R. Pandhari Pande	Eminent Theoretical Nuclear Physicist, APS T.W.Bonner prizewinner
4.	R. Raghavan	Ex-Director, Institute for Particle, Nuclear and Astronomical Sciences, Virginia Tech, USA, Founder, Borexino experiment, Gran Sasso, Italy
5.	C.V.K. Baba	Eminent Nuclear Physicist
6.	H.G. Devare	Former Editor, Hyperfine interactions
7.	Amit Roy	Former Director, IUAC, New Delhi, RRF (present)
8.	Mahananda Dasgupta	Faculty at ANU Canberra, Member IUPAP Commission, Nuclear Physics
9.	Sadiq Rangwala	Bhatnagar Award (2015)

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

As Item No 30 shows, the DNAP 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, colloquiua 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 DNAP 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 DNAP Chairperson and another member of the DNAP 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.

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

48. Give details of "beyond syllabus scholarly activities" of the department.

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

- DNAP Seminar
- NSF Colloquium
- VSRP Programme

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

The doctoral programmes in the DNAP are conducted under the TIFR University, which was recognized as a Deemed University by UGC in 2002.

50. Briefly highlight the contributions of the department in generating new knowledge, basic or applied.

The scientific activities of the department have been mainly in the experimental aspects of Nuclear Physics as well as in the field of atomic, molecular and optical physics. There is one research group that works on the condensed matter physics using nuclear techniques. Nuclear techniques applied to study solid state phenomenon at short length and time scales allowed the observation of

unusually high 4d magnetic moment on isolated Rh and Mo atoms, commonly absent in bulk solid forms. Local susceptibility studied through hyperfine interaction methods have illustrated finite size effects on moment formation and Kondo interactions for single magnetic impurities embedded in nano-scale solids. These observations provide insight into quantum effects on electron correlation.

In the field of nuclear physics, the Indian National Gamma detector Array (INGA) coupled to a digital data acquisition system is set-up at TIFR as a part of a national collaboration for the study of nuclear structure and dynamics from 2010. Around 30 PhD students from different Universities and Institutes from India and abroad have performed experiments in this set-up. Some of the salient scientific achievements of INGA campaigns include lifetime measurements in sub picosecond range in magnetic and antimagnetic rotation, degenerate dipole bands in A=110 and 130 regions in search for chiral rotation, polarization measurements of gamma rays to establish transverse and longitudinal wobbling mode at low spin High spin states in closed shell nuclei for testing shell model predictions and shape evolution. Indigenous development of beam diagnostic devices, vacuum components for accelerators, electronic devices were also carried out in this period. Moreover, a 4-pi sum-spin spectrometer was built at TIFR for measurement of angular momentum gated high energy gamma-rays from excited nuclei. This facility in conjunction with a gas-filled magnetic spectrometer in IUAC-Delhi is routinely used by graduate students of experimental nuclear physics from different Indian universities and researchers from India and abroad for cutting edge research in heavy-ion induced nuclear reaction dynamics and structure at high excitation energy. Major predictions about dynamics of two-neutron halo nuclei were also carried out from pure three-body model calculations. Experimentation validations of two such predictions regarding quantum states in the 14Be and 20C halo nuclei. There is one group in the department that worked on the development of transport and hydrodynamics models to study the properties of hot and dense nucleus / quark gluon plasma formed in relativistic heavy ion collisions.

In the atomic and molecular collisions activities the ionization and fragmentation studies of RNA base molecule like Uracil were carried out where the large forward backward asymmetry was observed in the differential cross section. The absolute total ionization cross section measurements for Uracil and

water molecules were carried out on a wide energy range (keV-MeV). The collective plasmon excitation in electron emission spectrum from C_{60} fullerene and Coronene (which is a PAH molecule) in fast ion collisions was observed. The study of Young type electron interference in fast ion and electron collisions with H_2, N_2 and O_2 was also carried out. In the study of doubly excited states of Si, S, Cl through high resolution X-ray spectroscopy the 2p3d – 1s3d line was observed. The ECRIS machine on the high voltage deck was actively used to provide low energy ion-beams to users from different institutes in country. Study of few body quantum dynamics was carried out with the help of momentum resolved measurements of fragmentation of transient molecular ions which are formed in collisions with either highly charged ions or electron. Towards this one group developed a 3D focusing Recoil ion momentum spectrometer. They used it to study the two body breakup dynamics of diatomic molecules as well as the two- and three-body decay dynamics of triatomic molecular system. In one such study they proposed a scheme to correctly identify the central and terminal N atoms in the fragmentation of multiply charged N_2O molecular ions. Apart from this they extensively studied the velocity and charge state dependence of the fragmentation of N_2 in collisions with highly charged ions. Taking a step further they also performed some measurement on the three-body decay of a tetra-atomic molecule, H_2O_2, in collisions with highly charged ions where they, for the first time observed a sequential decay mechanism in the three-body dissociation of H_2O_2 decaying into $H^+ + H^+ + O_2^+$. Some measurements were also performed on the breakup of H_2O, where a bond rearrangement reaction was observed in the breakup of H_2O^+ ions.

Another group working in the low energy electron molecule collisions developed a new experimental technique for measuring the absolute cross sections for dissociative ionization and dissociative attachment processes in electron-molecule collisions. They used this to obtain absolute cross sections for ionization of several molecules under electron impact. They also carried out the first ever absolute cross section measurement for dissociative electron attachment from electronically excited molecules. Apart from that they discovered the functional group dependence in dissociative electron attachment and a new method of controlling chemical reactions using electrons. They

developed a new 4π solid angle ion momentum imaging technique for studying structure of molecular negative ions and their decay dynamics. Using this technique they carried out first ever studies of negative ion momentum imaging of dissociative electron attachment in molecules. They developed a new technique to measure the absolute partial and total ionization cross sections for molecules that exist as solids at room temperature and its use for DNA and RNA bases and various other organic molecules. They also carried out the first ever experimental verification of the role of free electron as a catalyst.

Another group discovered several new results in extreme states particle acceleration and laboratory astrophysics. They invented the first ever MeV 'neutral' atom accelerator. They showed that biological (bacterial) plasmas as the brightest hard x-ray emitters under intense, femtosecond irradiation. Many firsts in giant magnetic field measurements, enhanced laser absorption and relativistic electron transport physics in intense laser-solid interactions were achieved by this group. They have also obtained a global recognition for establishing analogues of astrophysical phenomena in high intensity laser – matter experiments in the laboratory.

On the optics front one group had been responsible for several first-time measurements in the areas of disordered materials with gain. As example, the statistical intensity fluctuations were first identified quantitatively by the group, which provided evidence to the Gaussian-Levy-Gaussian transitions in the system. The quantitative technique provided for the analysis was based on an econophysical algorithm using Levy-stable laws, which was introduced into the field by this group. Subsequently, the group proposed and implemented a novel model for random lasers, called the Exponentially-tempered Levy sums, which is the first model that explains the statistical transitions in the system. This model has now enabled to identify the physical manifestation of extreme events in random lasers, namely, the coherent modes. This group has also demonstrated an aerosol-based random laser, which consists of microdroplets of a liquid dye. This system qualifies as a periodic-on-average random system (PARS) with gain when the microdroplets are all monodisperse. This is the first PARS system demonstrated in the field that can allow configurational-averaging. This system has realized several experimental measurements in weakly periodic systems that hitherto only remained in the theoretical domain.

Besides their regular activities in the light mater interaction field on group carried out the research that had output of societal relevance such as development of an optical technique for early-stage detection of malaria that relies on measurements of the birefringence of infected red blood cells, development of an optical-trap based method of probing differentiation of cancer cells.

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

Strengths

- The research activities of the department cover a very contemporary and active experimental research fields like nano and mesoscopic-optics, biological physics, ultra-intense light matter interaction, charged particle atomic and molecular collision, nuclear structure and nuclear spectroscopy using steady and radioactive ion beams and accelerator based condensed matter physics along with theoretical activity in relativistic heavy ion collision.
- Exceptionally good expertise in instrumentation in experimental nuclear physics, accelerator development including ECR based accelerator for highly charged ions, atomic collision physics, light matter interaction related areas and optics. Instruments developed to address contemporary nuclear physics problems are used by national and international groups.
- World leadership in selected area of work.
- Close interactions among different groups with diverse expertise within the department benefit the research programmes.
- Strong presence of the department in the graduate school teaching.

Weaknesses

- Lack of resources like space, manpower in terms of students and post docs

- Disinclination to advertise the achievements and lack of exposure to these areas of science at the university level in the country affects the overall interest shown by the young students in these areas of research
- Non-traditional field of research for some groups implies low influx of research students to the laboratories
- Limited presence of some of these areas at the national level makes it very difficult to get good number of skilled postdoctoral researchers essential for accelerated growth of the research activity
- Lack of theoretical support for many of the experimental activities of the department at the institutional as well as at the national level.

Opportunities

- World –wide recognition in recent achievements brings new opportunities for international collaboration.
- New areas of research are emerging like Non-linear optics of disordered systems with Anderson localization, catalytic electron reactions, laboratory astrophysics with ultra-intense light sources, biological physics with applications to radiation chemistry, neutrino-less double beta decay, nuclear structure with radioactive ion beam etc.
- The young investigators in the groups get the opportunities to interact with the world leaders in the field through world-wide collaborations and global interactions via conferences, schools and seminars .
- The recent path breaking successes with new instrumentation provide exciting opportunities for obtaining new physical insights into the problem of contemporary interests like electron molecule collisions, nano and mesoscopic optics, neutral and charged particle acceleration in intense light-matter interaction, novel excitation modes of nuclei etc.
- Due to diverse research interests within the department, there is a huge opportunity for cross breeding the ideas and exploring new possibilities.

Challenges

- Raising resources like space, students (man-power) and funding.
- Recruiting new faculty members to strengthen the ongoing activities as

well as explore new areas of research.

- Modest infrastructure strongly limits broadening of the research activity whereas the research groups have to compete at the international level.
- Popularizing these research fields at the undergraduate level and make the younger generation attracted to these fields within India.
- Interference in day to day administration by the extended bureaucracy, too many rules and not much freedom in execution.

52. Future plans of the department

The DNAP intends to grow its current research activities in diversified areas. There will be a study of the properties of hot and dense nucleus within transport and hydrodynamical model in relativistic heavy ion collisions. In nuclear physics, a high quality experimental facility to carry out advanced research in the field of nuclear astrophysics is going to be developed. Investigation of fundamental nucleon-nucleon interactions using low-energy light ion polarized beam and target is also envisaged. The nuclear structure research group plans to study the novel excitation modes of nuclei due to different symmetries, test of large scale shell model predictions for nuclei near closed shell and exotic nuclear isomers. In nuclear condensed matter physics programme using hyperfine interaction tool, in depth investigations on finite size effects on electronic and magnetic properties of nanocrystalline solids will be carried out. In accelerator-based condensed matter physics the quantum size effect on electron co-relation and magnetism will be explored. In nano and mesosopic optics, future studies involving ultrafast time resolution at a ultrahigh spatial resolution will be implemented, which are expected to yield unprecedented information on the quality factors of random resonators, simultaneously with the location of highest intensity spots in the resonator. Chemical control using electrons in gas phase and condensed phase molecules will be explored with emphasis on understanding the low energy electron-molecule interaction in all its details. Studies of electron collision on radicals and excited state molecules towards chemical control and applications will also be carried out. High energy density science is poised for a big leap with petawatt laser facilities to be set up in the next few years as well as active

participation in international collaborations in Europe and Japan will be taken up. Department intends to carry out more cutting edge research and generate human resource in high knowledge areas for India. It also intends to get involved with the graduate school teaching in the institute to engage the young minds joining the institute and get them interested in the research fields pursued in the department. Department will also put concrete efforts to expose the achievements and excitements of the field of research to the vast science community in the country particularly at the university level to attract the potential young researchers to pursue the research career in these areas.