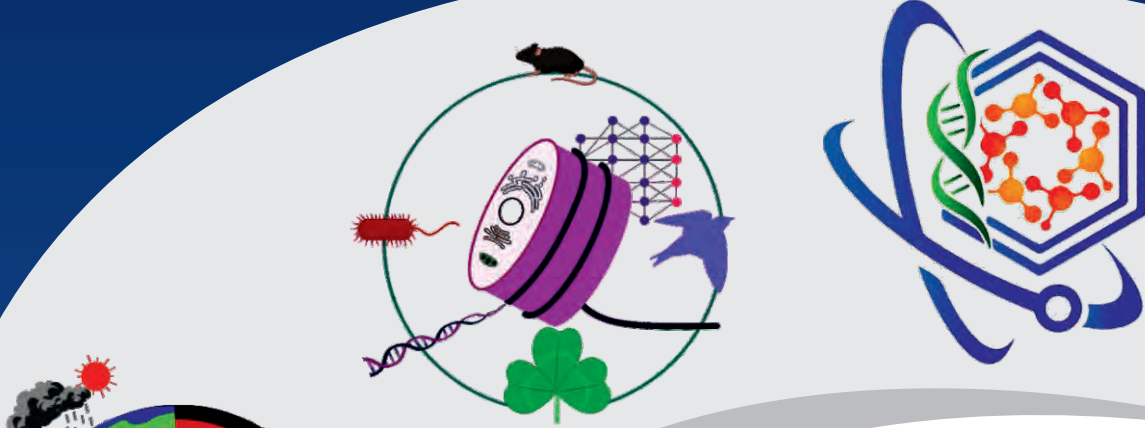


वार्षिक प्रतिवेदन/Annual Report

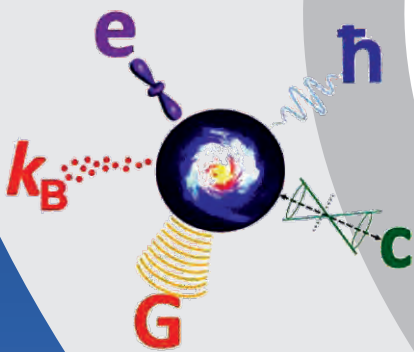
2021-2022



भारतीय विज्ञान शिक्षा एवं
अनुसंधान संस्थान तिरुपति

INDIAN INSTITUTE OF SCIENCE
EDUCATION AND RESEARCH TIRUPATI

- creating infinite possibilities...



CITATION

IISER Tirupati Annual Report 2022-2023
Tirupati, A.P. India

PUBLISHER

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वार्षिक प्रतिवेदन/Annual Report

2021-2022



IISER TIRUPATI CAMPUS

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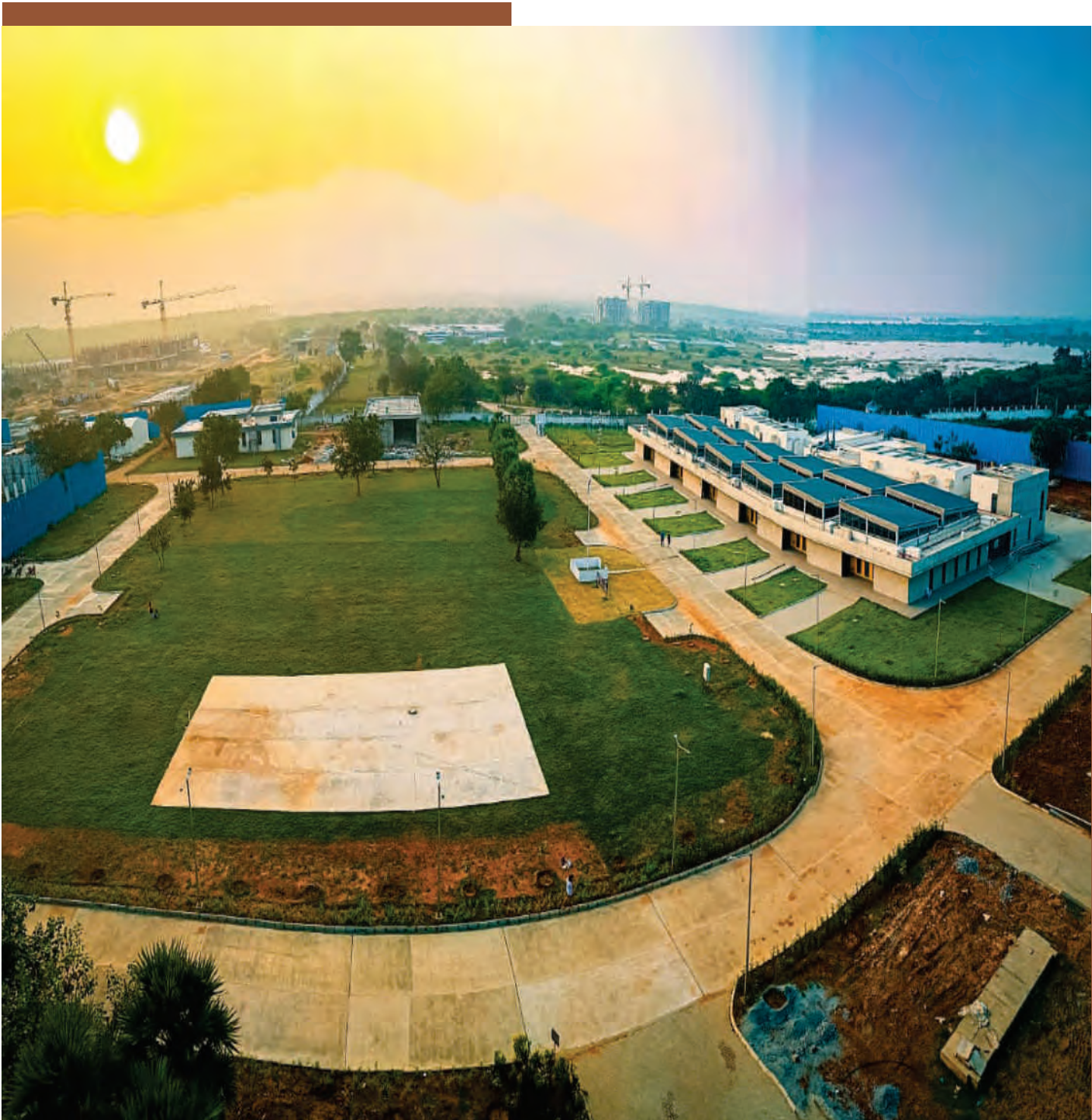


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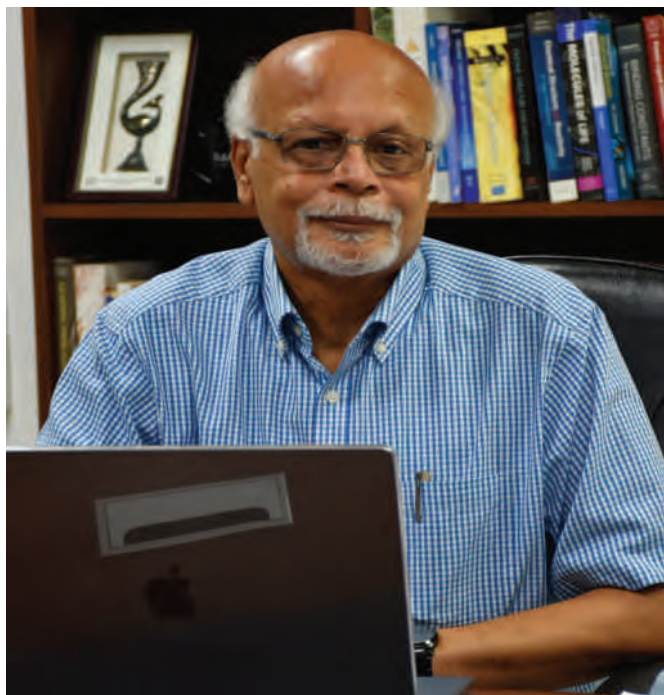
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PHOTON

INCOATEC

DIRECTOR'S REPORT



I am happy to present this report of the Institute for the year 2021-2022. Starting in 2015 with the first batch of 35 BS-MS students, IISER Tirupati has grown to 697 BS-MS students, 129 PhD students, 60 Int PhD students, and 30 Post-Doc Fellows, a total of 916 students. Come August, this number will cross 1100 with the fresh batch of BS-MS student admissions.

Our faculty strength is 49 across five departments, much below the DPR-approved ratio of 1:10 (faculty:students). Our administrative, engineering and support staff also totals to 49.

In the past year, 88 students received BS and MS degrees, and one student was awarded a BS degree. I am delighted to announce that the first 3 PhD degrees from IISER Tirupati were awarded this year.

The construction of the permanent campus of IISER Tirupati which started in 2020 had slowed down due to the Covid-19 pandemic. During 2021-2022, the pace picked up, but the earlier scheduled

completion date of November 2022 is now rescheduled to July 2023. Nevertheless, we have already started activities on the permanent campus in a few buildings. The undergraduate experimental laboratories with a capacity of 300 students per session in each discipline is functional, as is the hostel residency for 540 students. By end of August, two more halls of residence will be ready to house another 600 students, which will ensure that all the students of the first four years of the BS-MS program reside on campus.

Many buildings including the lecture hall complex, sports centre, dining hall, etc. will become functional in stages, and the Institute will begin functioning on this campus without waiting for the full completion of the campus. The master plan of our permanent campus received a 4-star rating from the GRIHA council (Green Rating for Integrated Habitat Assessment). The setting up of these facilities 25 km away from the transit campus was possible due to the dedicated work of faculty, technical and administration staff under the challenging pandemic situations.

During the academic year 2021- 2022, many of our students and faculty members have made us proud with their achievements. Dr E Balaraman and Dr Aravindan, Assistant Professors in Chemistry, received the MRSI Medal and Materials Science Annual Prize, respectively, from the Material Research Society of India.

We happily note that Prof B J Rao, who was the Chair of Biology, was appointed as the Vice-Chancellor of the Central University of Hyderabad in August 2020. We are also delighted that Prof Ramesh Sonti, a distinguished plant scientist who is well recognised for his transformative research on Samba Masuri rice, has joined us as the Chair of Biology. Under his leadership, we have established the Janaki Ammal Research Center for Excellence in Plant Sciences, which is already functioning from the permanent campus.

A total of seven PhD students from IISER Tirupati were selected in 2021 for the prestigious Prime Minister's Research Fellowship Award (PMRF). Akshay U Nair was selected for the Fullbright-Nehru Doctoral Research Program to work for nine months in a U.S. laboratory. Purva Atul Naik was selected for the MPI Master's thesis internship.

The IISER Tirupati iGEM team won Gold Medal in 2021 for the third consecutive year for their project "OviCloak: A Novel Contraceptive for Uterus Owners". Our students also won 2 top prizes this year in the highly competitive intercollegiate national science quiz competition Mimamsa, organized annually by IISER Pune.

The newly-formed IISER-IIT Tirupati joint research initiative, the Center for Atomic Molecular, Optical and Sciences and Technologies (CAMOST), held its first joint meeting on research progress in August 2021. Some publications have already emerged from this collaboration.

The ENS (France)-IISER Meeting on pedagogy practices was held between May 10-11, 2021, with the participation of several IISER and ENS faculty. As a result, a joint project submitted by IISER Tirupati with ENS has been shortlisted for the final stage.

The Tirupati Education Cluster was launched with the joint participation of IISER, IIT, SVU, and Sri

Padmavati Mahila University with the following objectives. (i) Designing and sharing courses (ii) Organise Training / Workshops for PhD students (iii) participate in collaborative research (iv) conduct Joint community activities and public outreach (v) set up incubation centres and start-ups, and (vi) address local societal /

environmental/ecological issues. IISER Tirupati has signed an MoU with the University of Melbourne, Australia to initiate a Joint PhD program.

During the 2021-2022 financial year, faculty at IISER Tirupati received 18 extramural projects from various funding agencies to the tune of 13.8 Crores, and this includes two projects from industry.

The Institute received a sanction of Rs.10 crores from DST to establish the first BSL-3 facility in Andhra Pradesh. This will enrich our research in infectious diseases such as Tuberculosis and in virology in general, and the facility will be used by collaborating Institutes and industries.

Over the past year, IISER Tirupati organized several science-related activities – workshops, research seminars and outreach activities under the Azadi Ka Amrit Mahotsav Program in the 75th year of India's Independence.

IISER Tirupati published 131 research papers in 2021 and in 2022; the number of publications has already crossed more than 100. The publications include high-impact journals such as ACS energy letters, Journal of the American Chemical Society, Organic Letters, ACS Chemical Neuroscience, Physical Review Letters, Phys Rev E, Gene, Plant Molecular Biology, Nature Reviews Chemistry, Nature Communications, etc., to name a few. We have now published a total of 500 research papers since our inception, and this is really creditable for a new Institute in its 7th year, with an active research program of only five years.

Out of the 88 BS-MS students who graduated this the past year, 54 students did their MS thesis work in external institutes, including six foreign institutes in Germany, Austria, France, Australia and Switzerland. 15 students have confirmed offers for joining PhD programs in institutes and universities outside India, in the US, Europe and

Australia, while two students are joining company jobs while one student will do an MBA.

Among the three PhD graduates, two are joining postdoctoral positions, at Northwestern University in the US and Queen's University, Canada.

With these highlights about the Institute, I end my report and hope that 2022 will see an even more rapid rise in productivity and scientific output. We are eagerly awaiting to see all our BS-MS, Int PhD and PhD students back on campus and raring to go, to compensate for the two years of slow academic pace due to the Covid-19 pandemic. Apart from the domain of academics, we are also looking forward

to their enthusiastic participation in sports, cultural and other extracurricular activities.

I wish to thank all at the Institute who made these achievements possible. The institute acknowledges the support from the Ministry of Education and the members of all statutory bodies of the Institute and the faculty from external Institutes for their share in online teaching.



K N Ganesh

GOVERNANCE

BOARD OF GOVERNORS

Chairperson

Prof Jyeshtharaj Bhalchandra Joshi, Emeritus Professor, ICT Mumbai

Members

Shri Rakesh Ranjan, Additional Secretary, Higher Education, Ministry of Education, Govt. of India - nominated by MoE to represent Secretary, MoE

Smt Darshana Dabral, JS & FA, Ministry of Education, Govt. of India

Prof KN Ganesh, Director, IISER Tirupati

Prof Govindan Rangarajan, Director, IISc Bengaluru

Prof Vijayamohanan K Pillai, Professor, IISER Tirupati

Prof Ramesh V Sonti, Professor, IISER Tirupati (from 28th June 2021)

Prof K N Satyanarayana, Director, IIT Tirupati (from 9th August 2021)

Shri Sameer Sharma, Chief Secretary, Andhra Pradesh (from 1st October 2021)

Prof Bhaskar Ramamurthy, Director, IIT Madras (until 19th June 2021)

Smt Aditya Nath Das, Chief Secretary, Andhra Pradesh (until 30th September 2021)

Dr K N Vyas, Secretary, Dept. of Atomic Energy (until 29th January 2022)

Prof H S Savithri, Professor, IISc (until 29th Jan 2022)

Dr Pankaj Sood, Principal Scientist, KVK, Himachal Pradesh (until 29th January 2022)

Dr Trilochan Mohapatra, Secretary (DARE) and DG, ICAR (until 29th January 2022)

Secretary

Dr C P Mohan Kumar, Registrar, IISER Tirupati

FINANCE COMMITTEE

Chairperson

Prof Jyeshtharaj Bhalchandra Joshi, Emeritus Professor, ICT Mumbai

Members

Shri Rakesh Ranjan, Additional Secretary, Higher Education, Ministry of Education, Govt. of India - nominated by MoE to represent Secretary, MoE

Prof KN Ganesh, Director, IISER Tirupati

Smt Darshana Dabral, JS & FA, Ministry of Education, Govt. of India

Col G Raja Sekhar, Registrar, IISER Pune

Dr R Premkumar, Registrar, IIT Bombay

Secretary

Dr C P Mohan Kumar, Registrar, IISER Tirupati

SENATE

Chairperson

Prof KN Ganesh, Director, IISER Tirupati

Members (Institutional)

Prof Vijayamohan K Pillai, Professor, Biology | Dean R&D

Prof Ramesh V Sonti, Professor, Biology | Dean Faculty (from 24th May 2021)

Prof D S Nagaraj, Professor, Mathematics

Dr Ramkumar Sambasivan, Associate Professor, Biology | Associate Dean, Doctoral Studies (up to 16th July 2021)

Dr Rajesh Viswanathan, Associate Professor, Chemistry & Biology | Associate Dean, Undergraduate Studies

Dr Raju Mukherjee, Assistant Professor, Biology | Associate Dean, Doctoral Studies (from 17th July 2021)

Dr Vasudharani Devanathan, Assistant Professor, Biology | Associate Dean, Student Activities (from 21st June 2021)

Dr CG Venketasubramanian, Assistant Professor, Mathematics | Associate Dean, Examinations/Evaluation (from 11th January 2022)

Dr Aniket Chakrabarty, Assistant Professor, Earth & Climate Sciences

Dr Sivakumar Vallabhapurapu, Associate Professor, Biology (until 20th June 2021)

Dr Raghunath O Ramabhadran, Assistant Professor, Chemistry (until 20th June 2021)

Dr Venketasubramanian C G, Assistant Professor, Mathematics (until 20th June 2021)

Dr Sudipta Dutta, Assistant Professor, Chemistry (until 31st December 2021)

Dr E Balaraman, Assistant Professor, Chemistry (from 21st June 2021)

Dr Lakshmi Lavanya, Assistant Professor, Mathematics (from 21st June 2021)

Dr Arunima Banerjee, Assistant Professor, Physics (from 1st January 2022)

Dr Chitrasen Jena, Assistant Professor, Physics (from 30th March 2022)

Dr Sreenivas Chavali, Assistant Professor, Biology (from 30th March 2022)

Members (External)

Prof K N Satyanarayana, Director, IIT Tirupati (until 30th September 2021)

Prof S Sankararaman, Professor, IIT Madras (until 30th September 2021)

Prof P Shailaja, Professor, University of Hyderabad (until 30th September 2021)

Prof Guruswamy Kumaraswamy, Professor, IIT Bombay (from 1st October 2021)

Prof Somdatta Sinha, *Professor, IISER Kolkata/Mohali (from 1st October 2021)*

Prof A Raghurama Raju, *IIT Tirupati (from 1st October 2021)*

Secretary

Dr C P Mohan Kumar, *Registrar, IISER Tirupati*

BUILDING AND WORKS COMMITTEE

Chairperson

Prof KN Ganesh, *Director, IISER Tirupati*

Members

Prof Vijayamohanan Pillai, *Professor, IISER Tirupati (from 7th July 2021)*

Dr C P Mohan Kumar, *Registrar, IISER Tirupati*

Dr Ramesh Srikonda, *Dean, Professor and Head, School of Planning and Architecture, Vijayawada*

Shri Sushant Baliga, *Addl. Director General (Retd.) CPWD, New Delhi*

Shri Mohan Khemani, *Retd. Chief Engineer (E), CPWD, New Delhi*

Secretary

Shri P V Narayana Rao, *Superintending Engineer, IISER Tirupati*

MEETINGS OF GOVERNANCE HELD DURING 2021-22

Meeting of Governance	Date of Meeting	Venue
14 th Meeting of Board of Governors	05.04.2021	Online
15 th Meeting of Board of Governors	18.06.2021	Online
16 th Meeting of Board of Governors	09.08.2021	By circulation
17 th Meeting of Board of Governors	08.10.2021	Online
18 th Meeting of Board of Governors	04.02.2022	Online
12 th Meeting of Finance Committee	05.04.2021	Online
13 th Meeting of Finance Committee	18.06.2021	Online
14 th Meeting of Finance Committee	08.10.2021	Online
15 th Meeting of Finance Committee	04.02.2022	Online
12 th Meeting of Senate	28.06.2021	Online
13 th Meeting of Senate	08.11.2021	Online
14 th Meeting of Senate	17.12.2021	Online
15 th Meeting of Senate	25.03.2022	Online
12 th Meeting of Building and Works Committee	15.09.2021	Online
13 th Meeting of Building and Works Committee	21.01.2022	Online

CAMPUS UPDATES



◀ *IISER Tirupati
Yerpedu campus*



◀ *Occupied hostel blocks*



◀ *Janaki Ammal Plant
Science Centre*



◀ *Research block under construction*



◀ *View of hostels and campus*

▼ *Undergraduate Chemistry Laboratory*



▼ *Undergraduate Physics Laboratory*



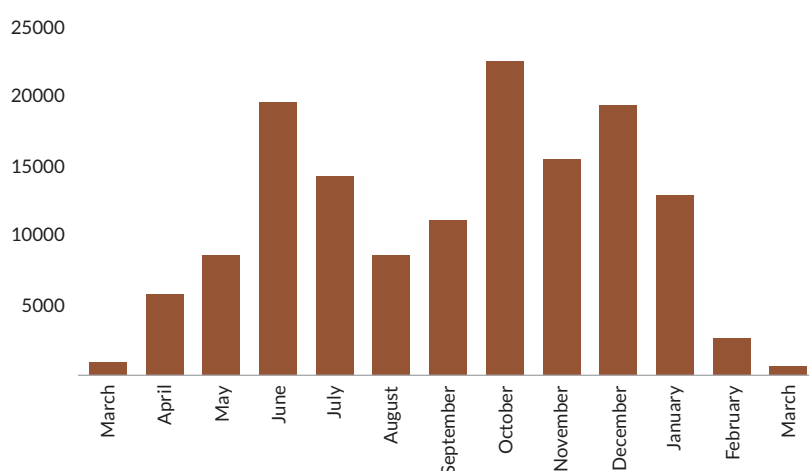
COVID-19 TESTING FACILITY AT IISER TIRUPATI 2021-2022

Between December 2020 and March 2022, IISER Tirupati ran a state-of-the-art laboratory to test Covid-19 samples in the transit campus at Mangalam. This facility, accredited by ICMR, was set up based on the suggestion of the Ministry of Education, the Government of India and the Government of Andhra Pradesh. The laboratory was equipped with modern scientific equipment such as an automated RNA isolation machine, CFX384 touch real-time PCR detection system, BSL2 biosafety cabinets with ducting, freezers (-40° C and -80° C), cooling centrifuges, etc., to ensure the isolation of positive samples as well as the highest standards of safety for the operating staff. Nodal officers Dr Pakala Suresh Babu (Assistant Professor, Biology) and Mr Inderpreet Singh Kohli (Deputy Registrar, Administration) coordinated all activities from the receipt of samples to the timely submission of results. The testing facility was manned by eight lab technicians, five data entry operators, two technical assistants, one research assistant, and a lab supervisor. A few PhD scholars volunteered to assist in the laboratory. The lab began to receive samples from the Government of Andhra Pradesh on 25th March 2021 and, since then, tested approximately 1,45,000 samples in this facility. On average, the laboratory processed a modal average of 763 samples per day, with a maximum of 1298 samples per day during peak outbreak months. Most samples received were from Tirupati and the surrounding regions.



◀ Covid-19 samples processed from March 2021-March 2022

Covid-19 samples processed from March 2021-March 2022



ACADEMICS



ACADEMIC ACHIEVEMENTS

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• SCIENTIFIC ACTIVITIES OF SCHOLARS	40
• iGEM COMPETITION 2021	49
• ACADEMIC ACHIEVEMENTS OF SCHOLARS	50

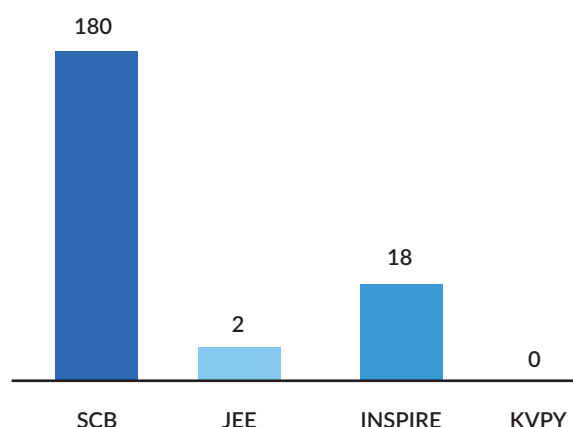
ACADEMIC PROGRAMS

BS-MS Students

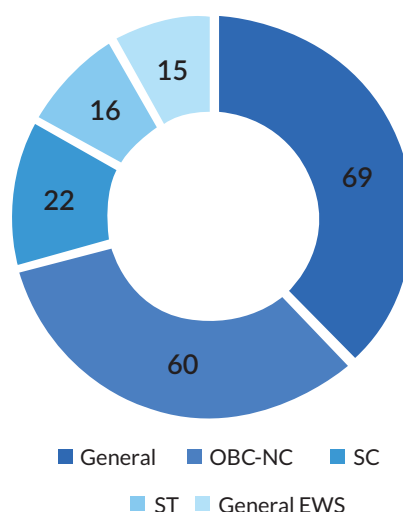
The academic program at IISER Tirupati is designed to educate and prepare students for a career in scientific research, and we offer programs for students at various stages. The five-year-long BS-MS program is the flagship of the IISER family and allows students to experience and participate in research first-hand.

IISER Tirupati has seen a steady increase in the number of students admitted over the years, and the intake of the BS-MS batch of 2021 comprised 182 students, with 116 girls and 66 boys. The second batch of BS-MS students who started in 2016, totalling 80 in number, graduated in May 2021. This is almost double the number of students compared to the first BS-MS batch (intake in 2015), totalling 45, which graduated in May 2020.

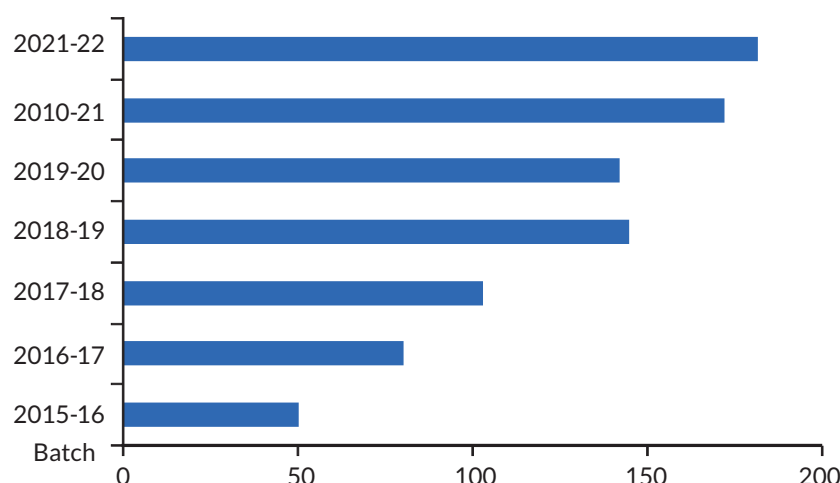
Students in the incoming BS-MS 2021 batch with scholarships



Caste categorisation of students in the incoming BS-MS 2021 batch



Growth of BS-MS students at IISER Tirupati over the years, starting with 2015.



STUDENTS IN THE INCOMING BS-MS BATCH OF 2021

Gafooruddin Moulana Rasheed Sk
Sangram Mohapatra
Sanchi Yashpal Chaware
Mannevaram Abhinava Reddi
Olivia Debbarma
Prapulla M
D Trisha
Supriya Adimurthy
Rishith Reddy
Kalapala Krupa Abhiyan
Sayed Sahil C
Surabhi Kumari
G Lavanya
Deepak R
Karam Grishma
Hare Sonam Santosh
Ashish Ranjan
K Shreya Rao
Pachhipulisu Rajasree Lakshmi
Parde Rhturani Sanjay
Gowrinanda R
A Sidarth Hariharan
Meenakshi R S
Sarthak Tyagi
Devanand P A
Vishal Vinod Kumar
Mahesh M
Katam Zennisha
P.bhuvanesh
Brahmanapallegeethamadhuri
Meenuga Sai Chandana
Burla Shreevennela Chandramouli
Sharada Yashwant Dalvi
Bandi Kavya Charita
Pralhad P
Khillare Pooja Samadhan
Duddela Bala Sai Harshitha
M V P S Sriyanth
Samrik Chowdhury
Gummadi Manonmani
Pritika Raj
Khyati Chaudhary
Karan Jit Daimary
Anna Geveena
Anurag
Rayis T R
Mude Kalyan
Nandana. K
Shankar Advait Raman
Brishti Kundu
Dhumal Shriram Santosh
Akshay K
A Adithya Hitesh
Behara Sasi Mitra
Lellapalli Rishitha
Apoorv Anand Namjoshi
Gautam Ashutosh Godbole

Talegaonkar Arya Rajeshbuwa
Goda Rani
Amrita Pradeep
Hitesh Devalapelli
Akshara P
Gosavi Gunjan Suresh
Akash V Satheesh
Hemanth S
Jagannadham Nuthana Varshini
Mithan Kumar G R
Ravikalaushasree
Subhashree Priyadarshini Panda
Patil Sakshi Rajkumar
Vankadavath Ravi Naik
Atharva Kanfode
Shruti Vivekanand Vibhute
Kelkar Shreyas Madhav
Aditya Avinash Deore
Nehad Ahmed
Suryendhu Sajan
Shreya S Dodamani
Parinitha M
Deshpande Manish Ramarao
Diya A
Prachi Kurhade
Rayipilli Preethi
Haripriya S
Payal
Sri Sai Charan S
Suridevi Rishi Sandeep
Siddhant Ray
Gugulothu Harichandana
Sachin Dinkar Kamble
Sai Srividya M N V
Sayan Mondal
Harsh Uttam
Mayank Verma
Gonugunta Sruthi
Mansi Somani
Kadeeja U A
Anishka Sunil
Namdar Hari Kalpana
Ashitha Nizar
Anciya V R
Pranay Narayan
Laishram Yashmine Devi
Adhya.b.jayan
Rajkumari Devisana
Dinesh Kumar
Kartik Sharma
Panchal Dhruvi Rakeshkumar
Isha Ziyana
Sneha Suresh
Farzana Faisal Gaffoor
Thomas Jose Maliakal
Sivakami J
Vanisha Mishra

Shamil Muhammad
Sreya L
Akhila K C
Aiswarya Ratna A S
Nikhitha Kv
Mandvi Chaudhary
Yashas M
Priyadharshini.J
Chetna Upadhyay
Mahendradev Dinesan
Spoorti S
Sona Ansari
Arpita Bhat
Vasudev P J
Sandhra M S
Sethulakshmi Nair
Gayathri S
Saranga P
Nandana Manoj
Shahma P K
Neha P
Esha Sudheer
Anjala Shajinos
Kankan Sardar
Kamale Abhiram
Nikhita C B
Ritika
P S Abhirami
Aswathi Viswanath C
Fadiya Faisal
M.akshaya
Goury K L
Ashish Sam Abraham
Firdows Siraj
Nandana K
Atheena Krishna D
Shruthi S Rao
Himanshu Bansal
Ghatage Prajakta Suhas
Vaishakhi VK
Athira Sreekumar
Arshnoor Kaur
Siddharth Paliwal
Shubhendu Acharjee
Nivedya K V
Ritika Raj
Anumay Gopal
Sreeja Roy
Jugnu Shukkur
Khokale Sankalp Rishikesh
Aamina Amal E M
Sahithya Krishnan M
Sneha S Dodamani
Divyasikha K Sutar
Smriti S Dandin
Arivazhagan La
Khatravath Akshitha Rathod

INTEGRATED PhD PROGRAM (IPhD)



BIOLOGY

Manita Raina
Rachote Nagashree
Shraddha Gopal Bire
Siddhant Sharma
Souvik Das



CHEMISTRY

Barsha Pathak
Partha Sarathi Saha
Shivangi Singh
Smruti Rekha Padhy



PHYSICS

Rohit Deb
Shneha Biswas
Siddhartha Roy
Soumadip Pakrashi
Sibaram Behera

*Department-wise intake
(IPhD Aug-2021)*

5

4

5

PhD PROGRAM



BIOLOGY

Anoop Ramachandra Bhat
Archita Sharma
Deependra Singh Gohil
Ingle Gaurav Milind
Kalpana T
Latika Joshi
Sanskriti Parida
Anirban Mukherjee



CHEMISTRY

Abhijit Nandy
Baldaniya Bhavnesb Chandubhai
Debosmita Ghosh
Jyothilakshmi S



PHYSICS

Sahu Piyush Mahesh
Nilanjana Nandi
Sandhyarani Panigrahy

*Department-wise intake
(PhD Aug-2021)*

9

4

3

*Fellowship wise: Student Number
(PhD Aug-2021)*

CSIR-NET-JRF

9

UGC-JRF

5

DBT-JRF

1

INSPIRE-DST

1

IISERT

0

NFOBC

0

POST DOCTORAL RESEARCH FELLOWS 2021-22

The Post Doctoral community at IISER Tirupati is growing, with a few new scholars joining the program each year. In the past year, we had two scholars join the Biology department - Dr Katikeya Tiwari and Dr Soumyaparna Das.



BIOLOGY

2

COURSE LISTINGS

The BS-MS program offers courses in all the basic sciences for the first four semesters (I-IV) of the program. This is followed by advanced courses at the MS level in semesters V-VIII where students can choose their courses based on their interests and inclination. The advanced courses are of two types: 4 credits and 3 credits, and they can be lecture/lab (experimental/computer courses). 4 credit courses are core courses with 40 lectures /contact hours per semester. They are aimed at providing a basic and in-depth understanding of the subject. Courses with 3 credits get 30 lectures/contact hours in one semester, and they can be interdisciplinary or advanced, or specialized in content.

The advanced courses are open to students in the Integrated PhD program, where students choose courses as per the requirements in each discipline. Some of the advanced level courses are open to PhD students also. In addition, a set of courses called Modular Courses have been introduced to impart focused training and skill development in specialized topics to research students.

The lab courses for the Semester III BS-MS students that could not be conducted online were conducted in person in the newly established UG labs in the permanent campus during December 2021 as part of Semester IV. The lab courses for Spring 2022 were conducted in person during the semester. The advanced lab courses in Physics were completed in person since students were back on the temporary campus. Since the new batch of BS-MS 2021 joined late, their first two semesters, I and II, are conducted between Jan-July 2022.

The list of courses offered in Monsoon 2021 and Spring 2022 are listed below with their details.

COURSE OFFERED IN MONSOON SEMESTER 2021

Semester- III BS-MS program

Course Code	Name of the Course	Name of the Instructor/s	Credits
BIO211	Foundations of Biology III: Evolution and Ecology	Dr V V Robin	3
BIO213	Biology for Society	Dr Raju Mukherjee*, Dr Sanjay Kumar, Dr Vasudharani Devanathan Dr Annapurna Devi Allu, Dr Ramkumar Sambasivan	3
BIO112 [#]	Biology Lab I(Virtual)	Dr Pakala Suresh B*, Dr Sanjay Kumar	3
BIO122 [#]	Biology Lab II(Virtual)	Dr Sivakumar V*, Dr Swarup R C	3
CHM211	Inorganic Chemistry	Dr Arun Kumar Bar*, Dr Pankaj Kumar Koli	3
CHM122 [#]	Chemistry Lab I(Virtual)	Dr Pankaj Kumar Koli*, Dr Nirmala K and Dr Soumit S M	3
MTH211	Multivariable Calculus	Dr Girja Shanker Tripathi*, Dr Subhash B	3
PHY211	Foundations of Physics III- Electricity & Magnetism	Dr Ravi Kumar Pujala	3
PHY122 [#]	Physics Lab I(Virtual)	Dr Jessy Jose*, Dr Tapan C Adhyapak, and Dr Eswaraiah Chakali	3

#Completed in virtual mode in Monsoon 2021

Semester- V, VII BS-MS program & I, III Integrated PhD

Course Code	Name of the Course	Name of the Instructor/s	Credits	Sem open in		
				BSMS	iPhD	PhD
Biology						
BIO302	Lab Rotation (Summer)	Dr Raju Mukherjee	3		III	
BIO308	General Biology	Dr Sanjay Kumar	2		I	
BIO311/611	Introductory Immunology	Dr V Sivakumar	4	V, VII	I	Y
BIO313/613	Evolution	Dr Nandini Rajamani	4	V, VII	I, III	Y
BIO315/615	Molecular Plant Physiology	Dr Swarup Roy Choudhury	4	V	I, III	Y
BIO316/616	Neurobiology	Dr Vasudharani Devanathan	4	V, VII	III	Y
BIO318/618	Genetics	Dr Viji Subramanian*, Prof Ramesh Sonti	4	V, VII	I	Y
BIO337/637	Pandemics- Disease and Prevention	Dr Suchi Goel*, Dr Ashwani Sharma, Prof G Ambika, Dr Raju Mukherjee, Dr Shibdas Banerjee, Dr Rajesh Viswanathan	3	V, VII	I, III	Y
BIO339/639 (CHM332/632)	Separation Science and Techniques	Dr Shibdas Banerjee*, Dr Gopinath Purushothaman, Dr Nirmala Krishnamurthy	3	V, VII	III	Y
BIO401	Lab Rotation	Dr Raju Mukherjee	3		III	
BIO410	Semester Project	Dr Hussain Bhukya	3	VII		
BIO412/712	Animal Developmental Biology	Dr Ramkumar Sambasivan	4	VII	III	Y
BIO413/713	Big Data in Biology	Dr Sreenivas Chavali	4	VII	III	Y
BIO416/716 (CHM415/715)	Biophysical Chemistry	Dr Soumit Sankar Mandal*, Prof K N Ganesh	4	VII	I, III	Y
BIO431/731 (CHM431/731)	Fluorescence in Biology	Dr Nibedita Pal	3	VII	I, III	Y
BIO433/733	Plant Stress Biology	Dr Annapurna Devi Allu, Prof Ramesh Sonti	3	VII	I, III	Y
BIO435/735	Infection Biology	Dr Suchi Goel*, Dr Raju Mukherjee	3	VII	I, III	Y
BIO441/741	Biophysics	Dr Hussain Bhukya*, Dr Nibedita Pal	3	VII	I, III	Y

Chemistry

CHM301	Lab Rotation	Dr Soumit Sankar Mandal*, Dr Jatish Kumar	3	-	I	-
CHM311/611	Quantum Chemistry I	Dr Raghunath O Ramabhadran*, Dr Debasish Koner	4	V, VII	I, III	Y
CHM312/612	Physical Organic Chemistry	Dr Shibdas Banerjee*, Dr Raghunath O Ramabhadran	4	V, VII	I, III	Y
CHM313/613	Main Group Chemistry	Dr Sudipta Roy*, Dr Arun Kumar Bar	4	V, VII	I, III	Y

Course Code	Name of the Course	Name of the Instructor/s	Credits	Sem open in		
				BSMS	iPhD	PhD
CHM315/615	Forensic Science	Dr Nirmala Krishnamurthy*, Dr Ashwani Sharma	4	V, VII	I, III	Y
CHM331/631	Solid State Chemistry	Dr V Aravindan*	3	V, VII	I, III	Y
CHM332/632 (BIO339/639)	Separation Science & Techniques	Dr Shibdas Banerjee*, Dr Gopinath Purushothaman, Dr Nirmala Krishnamurthy	3	V, VII	I, III	Y
CHM410	Semester Project	Dr V Aravindan*, Dr Gopinath Purushothaman	3	VII		
CHM401	Lab Rotation	Dr Soumit Sankar Mandal*, Dr Jatish Kumar	7		III	
CHM411/711	Molecular Symmetry and Spectroscopy	Dr Jatish Kumar	4	VII	I, III	Y
CHM412/712	Medicinal Chemistry	Dr Rajesh Viswanathan*, Dr Ashwani Shirma	4	VII	I, III	Y
CHM413/713	Bio-Inorganic Chemistry	Dr Pankaj Kumar Koli*, Dr E Balaraman	4	VII	I, III	Y
CHM414/714	Transition Metal Chemistry	Dr E Balaraman*, Dr Sudipta Roy	4	VII	I, III	Y
CHM415/715 (BIO416/716)	Biophysical Chemistry	Dr Soumit Sankar Mandal*, Prof K N Ganesh	4	VII	I, III	Y
CHM416/716 (PHY411/711)	Advanced Statistical Mechanics	Dr Rakesh S Singh	4	VII	I, III	Y
CHM431/731 (BIO431/731)	Fluorescence in Biology	Dr Nibedita Pal	3	VII	I, III	Y
CHM432/732 (PHY432/732)	Materials Science	Dr Janardan Kundu*, Dr V Aravindan, Prof Vijaya Mohanan Pillai	3	VII	I, III	Y
CHM433/733	Organic Spectroscopy	Dr Gopinath Purushothaman*, Dr Rajesh Viswanathan	3	VII	I, III	Y
CSA434/734 CHM434/734 ECS434/734 PHY434/734	Data Science I	Dr Debasish Koner*, Dr Lakshmi Lavanya, Dr Arunima Banerjee, Dr K Saikranthi	3	V, VII	I, III	Y

Earth and Climate Science

ECS311	Solid Earth Geophysics	Dr Utpal Saikia	4	V, VII		
ECS410	Semester Project	Dr Aniket Chakrabarty	3	VII		
ECS411/711	Atmospheric Thermodynamics & Cloud Physics	Dr K Saikranthi	4	VII		Y
ECS412/712	Advanced Mineral Sciences	Dr Aniket Chakrabarty	4	VII		Y
CSA434/734 CHM434/734 ECS434/734 PHY434/734	Data Science I	Dr Debasish Koner*, Dr Lakshmi Lavanya, Dr Arunima Banerjee, Dr K Saikranthi	3	V, VII		Y
PHY439/739 ECS439/739	Complex Systems	Prof G Ambika	3	VII		Y

Course Code	Name of the Course	Name of the Instructor/s	Credits	Sem open in		
				BSMS	iPhD	PhD
Mathematics						
MTH303	Semester Project (Summer)	Dr Venketasubramanian C G	4		III	
MTH311	Group Theory	Dr Girja ShankerTripathi	4	V, VII	I, III	
MTH312	Real Analysis	Dr Gururaja H A	4	V, VII	I, III	
MTH313	Topology	Dr Souradeep Majumder	4	V, VII	I, III	
MTH314	Linear Algebra	Dr Venketasubramanian C G	4	V, VII	I, III	
MTH331	Elementary Number Theory	Dr Nagaraj D S*, Dr Shalini Bhattacharya	3	V, VII	I, III	
MTH332	Statistical Inference	Dr Ishapathik Das(IIT T) LC Dr Lakshmi Lavanya	3	V, VII	I, III	
MTH401	Semester Project	Dr Gururaja H A	4		III	
MTH410	Semester Project	Dr Gururaja H A	3	VII		
MTH411	Fields and Galois Theory	Dr Rajat Tandon* LC Dr Venketasubramanian C G	4	VII	III	
MTH412	Functional Analysis	Dr R Lakshmi Lavanya	4	VII	III	
MTH413	Introduction to Algebraic Topology	Dr Subhash B	4	VII	III	
MTH414	Ordinary Differential Equations	Dr Anilatmaja Aryasomayajula	4	VII	III	
MTH415	Representation Theory of Finite Groups	Dr Nagaraj D S	4	VII	III	
MTH416	Probability	Dr Moumanti Podder (IISERP), LC Dr Souradeep Majumder	4	VII	III	
Physics						
PHY311/611	Classical Mechanics	Prof G Ambika	4	V, VII	I, III	Y
PHY312/612	Electrodynamics	Dr Tapan C Adhyapak	4	V, VII	I, III	Y
PHY313/613	Quantum Mechanics I	Dr Sambuddha Sanyal	4	V, VII	I, III	
PHY314/614	Mathematical Methods in Physics	Dr Arunima Banerjee	4	V, VII	I, III	Y
PHY315/615	Astrophysics	Dr Jessy Jose*, Dr Eswaraiah Chakali	4	V, VII	I, III	Y
PHY331	Electronics	Dr Kanagasekaran T	3	V, VII	I, III	
PHY335	Advanced Physics Lab I (Virtual)	Dr Kanagasekaran T*, Dr Ravi Kumar Pujala	3	V, VII	I	
PHY410	Semester Project	Dr Jessy Jose	3	VII		
PHY411/711 (CHM416/716)	Advanced Statistical Mechanics	Dr Rakesh S Singh	4	VII	III	Y

Course Code	Name of the Course	Name of the Instructor/s	Credits	Sem open in		
				BSMS	iPhD	PhD
PHY413/713	Atomic & Molecular Physics	Dr S Sunil Kumar	4	VII	III	Y
PHY415	Advanced Physics Lab III (Virtual)	Dr S Sunil Kumar*, Dr Chitrasen Jena	4	VII		
PHY416/716	Experimental Methods in Physics	Dr Chitrasen Jena	4	VII	III	Y
PHY417/717	Computational Methods in Physics	Dr Sudipta Dutta	4	VII	III	Y
PHY432/732 (CHM432/732)	Material Science	Dr Janardan Kundu*, Dr V Aravindan, Prof Vijayamohanan Pillai	3	VII	I, III	Y
PHY433/733	Quantum Field Theory	Dr Sachin Jain (IISERP) LC Dr Sambuddha Sanyal	3	VII	III	Y
CSA434/734 CHM434/734 ECS434/734 PHY434/734	Data Science I	Dr Debasish Koner*, Dr Lakshmi Lavanya, Dr Arunima Banerjee, Dr K Saikranthi	3	V, VII	I, III	Y
PHY439/739 ECS439/739	Complex Systems	Prof G Ambika	3	VII	I, III	Y

COURSE OFFERED IN SPRING SEMESTER 2022

Semester- I BS-MS program

Course Code	Name of the Course	Name of the Instructor/s	Credits
BIO110	Basic Biology	Dr Eswaraya Ramireddy	0
BIO111	Foundations of Biology I: Basic Principles	Dr Swarup Roy Chaudhury*, Prof Ramesh Sonti, Dr Suchi Goel, Dr Hussain Bhukya, Dr Nandini Rajamani	3
BIO112	Biology Lab I: Basic Biology	Dr Pakala Suresh Babu*, Dr Sanjay Kumar,	3
CHM111	General Chemistry	Dr Kiran Kumar*, Dr Janardan Kundu, Dr Pankaj Kumar Koli	3
MTH110	Basic Mathematics	Dr Gururaja H A	0
MTH111	Introduction to Mathematics	Dr Anilatmaja Aryasomayajula	3
PHY111	Foundations of Physics I: Mechanics	Dr Dileep Mampallil	3
IDC111	Mathematical Methods	Dr Annwesha Dutta	3
HSS110	English	Dr M Madhu Sudhan Rao (Guest Faculty)	0

Course Code	Name of the Course	Name of the Instructor/s	Credits
Semester- II BS-MS program			
BIO121	Introductory Biology II: Genetics and Molecular Biology	Dr Annapurna Devi Allu* & Prof Ramesh Sonti	3
BIO112	Biology Lab I: Basic Biology(Virtual)	Dr Pakala Suresh Babu*, Dr Sanjay Kumar	3
BIO122	Biology Lab II: Biochemistry and Molecular Biology(Virtual)	Dr Siva Kumar V*, Dr Swarup Roy Choudhury	3
CHM121	Physical Chemistry	Dr Janardan Kundu*, Dr Aravindan V, Dr Jatish Kumar, Dr Raghunath R	3
CHM122	Chemistry Lab I(Virtual)	Dr Pankaj Kumar Koli*, Dr Soumit S Mandal, Dr Nirmala Krishnamurthy	3
MTH121	Single Variable Calculus	Dr Subhash B*, Dr Gururaja H A	3
MTH122	Linear Algebra and Applications	Dr R Lakshmi Lavanya	3
PHY121	Foundations of Physics II: Waves & Optics	Dr Eswaraiah Chakali	3
PHY122	Physics Lab I(Virtual)	Dr Dileep Mampallil*, Dr Annweshia Dutta, 2 PDRFS	3
HSS121	Critical Reading, Writing and Communication	Prof C Vani (Guest Faculty)	2

Semester- IV BS-MS program

BIO221	Introductory Biology IV: Biology of Systems	Dr Vasudharani Devanathan*, Dr Sreenivas Chavali, Dr Sanjay Kumar, Dr Nandini Rajamani, Dr Sivakumar V	3
CHM212 [#]	Chemistry Lab II	Dr Kiran Kumar, Dr Gopinath Purushothaman, Dr Soumit S Mandal, Dr Nirmala Krishnamurthy	3
CHM221	Organic Chemistry	Dr Gopinath Purushothaman*, Dr Shibdas Benerjee	3
CHM222	Chemistry Lab III	Dr Kiran Kumar*, Dr Soumit S Mandal, Dr Arun Kumar Bar	3
CSA212	Introduction to Computer Programming	Dr Raghunath Ramabhadran	3
HSS221	History of Science	Prof Vijayamohanan Pillai*	2
MTH221	Probability and Statistics	Dr Souradeep Majumder*, Dr Girja Shanker Tripathi	3
MTH222	Basic Structures in Mathematics	Dr Venketasubramanian C G	3
PHY212 [#]	Physics Lab II: Electricity, Magnetism & Optics	Dr Jessy Jose, Dr Tapan C Adhyapak, Dr Eswaraiah Chakali	3
PHY221	Foundations of Physics IV: Quantum Physics	Dr S Sunil Kumar	3
PHY222	Physics Lab III	Dr Ravi Kumar Pujala, Dr Tapan C Adhyapak, Dr Eswaraiah Chakali, TAs	3

[#]Conducted in December 2021 and added to semester IV.

Semester- VI, VIII BS-MS program & II, IV Integrated PhD

Course Code	Name of the Course	Name of the Instructor/s	Credits	Sem open in		
				BSMS	iPhD	PhD
Biology						
BIO302	Semester Project	Dr Hussain Bhukya	4	-	II	-
BIO321/621	Microbiology	Dr Suchi Goel	4	VI, VIII	II, IV	Y
BIO322/622	Biochemistry	Dr Raju Mukherjee	4	VI, VIII	II, IV	Y
BIO324/624	Animal Physiology	Dr Ramkumar Sambasivan	4	VI, VIII	II, IV	Y
BIO327/627	Advanced Ecology	Dr V V Robin	4	VI, VIII	II, IV	Y
BIO328/628	Advanced Molecular Biology	Dr Pakala Suresh Babu	4	VI, VIII	II, IV	Y
BIO341/641	Cell Biology	Dr Sanjay Kumar* & Dr Viji Subramanian	3/4	VI, VIII	II, IV	Y
BIO402	Semester Project	Dr Hussain Bhukya	18	-	IV	-
BIO415/715	Applied Plant Biology	Dr Eswarraya Ramireddy*, Dr Annapurna Devi Allu	4	VIII	II, IV	Y
BIO420	Semester Project	Dr Eswarraya Ramireddy	3	VIII	-	-
BIO421/721	Elements of Structural Biology	Dr Nibedita Pal*, Dr Hussain Bhukya	4	VI, VIII	II,IV	Y
BIO425/725	Plant Developmental Biology	Dr Swarup Roy Choudhury* & Dr Eswarraya Ramireddy	4	VI, VIII	II, IV	Y
BIO427/727	Bioinformatics lab	Dr Sreenivas Chavali	4	VI, VIII	II, IV	Y
BIO444 /744 CHM444 /744	Chemical Biology	Dr Ashwani Sharma*, Prof KN Ganesh	3	VI, VIII	II, IV	Y
BIO445/745	Advanced Neuroscience	Dr Vasudharani Devanathan* & Guest Faculty	3	VI, VIII	II, IV	Y
BIO462/762 CHM462/762 CSA462/762 ECS462/762 PHY462/762	Data Science II	Dr Debasish Koner*, Dr Arunima Banerjee	3	VI, VIII	IV	Y
BIO525/825	Communicating Biology	Dr Sreenivas Chavali*, Prof Ramesh Sonti & Dr Ramkumar Sambasivan	2	-	II, IV	Y
BIO524/824	Genome Editing	Dr Viji Subramanian	2	-	II, IV	Y

Chemistry

CHM302	Lab Rotation II	Dr Soumit S Mandal*, Dr Jatish Kumar	4	-	II	-
CHM321/621 & PHY322	Statistical Thermodynamics	Dr Rakesh S Singh*, Dr Janardan Kundu	4	VI, VIII	II, IV	Y

Course Code	Name of the Course	Name of the Instructor/s	Credits	Sem open in		
				BSMS	iPhD	PhD
CHM322/622	Organic Synthesis I	Dr Shibdas Benerjee*, Dr Gopinath Purushothaman, Dr Kiran Kumar	4	VI, VIII	II, IV	Y
CHM323/623	Organometallic Chemistry	Dr Sudipta Roy*, Dr E Balaraman	4	VI, VIII	II, IV	Y
CHM325/625	Chemical Kinetics and Surface Chemistry	Dr Jatish Kumar*, Dr Soumit S Mandal	4	VI, VIII	II, IV	Y
CHM326/626	Electrochemistry	Dr V Aravindan*, Prof Vijayamohanan Pillai	4	VI, VIII	II, IV	Y
CHM420	Semester Project	Dr V Aravindan*, Dr Gopinath Purushothaman	3	VIII	-	-
CHM443/743	Food Chemistry	Dr Nirmala Krishnamurthy	3	VI, VIII	II, IV	
CHM402	Lab Rotation IV	Dr Soumit S Mandal*, Dr Jatish Kumar	4	-	IV	-
CHM421/721	Quantum Chemistry II	Dr Padmabati Mondal*, Dr Debasish Koner	4	VIII	II, IV	Y
CHM422/722	Organic Synthesis II	Dr Rajesh Viswanathan*, Dr Kiran Kumar	4	VIII	II, IV	Y
CHM423/723	Chemistry of d- and f- Block Elements	Dr Arun Kumar Bar*, Dr Sudipta Roy	4	VI, VIII	II, IV	Y
CHM444/744 & BIO444/744	Chemical Biology	Dr Ashwani Sharma*, Prof K N Ganesh	3	VIII	II, IV	Y
CHM441/741	Inorganic Spectroscopy	Dr E Balaraman*, Dr Pankaj Kumar Koli	3	VIII	II, IV	Y
CHM464/764	Astrochemistry	Dr Raghunath O Ramabhadran	3	VIII	II, IV	Y
CHM462/762 BIO462/762 CSA462/762 ECS462/762 PHY462/762	Data Science II	Dr Debasish Koner*, Dr Arunima Banerjee	3	VI, VIII	IV	Y
CHM463/763 & PHY463/763	Simulation and Modelling	Dr Padmabati Mondal*, Dr Rakesh S Singh	3	VIII	II, IV	Y
CHM821	2D-NMR Spectroscopy	Dr Rajesh Viswanathan	2	-	-	Y

Earth and Climate Science

ECS321	Introduction to Earth and Climate Science	Dr Aniket Chakrabarty, Dr K Saikranthi	4	VI	-	-
ECS420	Semester project	Dr Aniket Chakrabarty	3	VIII	-	-
ECS421/721	Igneous Petrology	Dr Aniket Chakrabarty	4	VIII	-	Y
ECS422/722	Atmospheric Dynamics	Dr K Saikranthi	4	VIII	-	Y
ECS423/723	Geophysical Inverse Theory	Dr Utpal Saikia	4	VI, VIII	-	-

Course Code	Name of the Course	Name of the Instructor/s	Credits	Sem open in		
				BSMS	iPhD	PhD
CSA462/762 ECS462/762 CHM462/762 BIO462/762 PHY462/762	Data Science II	Dr Debasish Koner*, Dr Arunima Banerjee	3	VI, VIII	IV	Y

Mathematics

MTH321	Rings and Modules	Dr Shalini Bhattacharya	4	VI, VIII	II, IV	-
MTH322	Complex Analysis	Dr Gururaja H A	4	VI, VIII	II, IV	-
MTH323	Analysis in Euclidean Spaces	Dr Girja Shanker Tripathi	4	VI, VIII	II, IV	-
MTH324	Measure Theory and Integration	Prof Nagaraj D S	4	VI, VIII	II, IV	-
MTH342	Introduction to Classical Groups	Dr Venketasubramanian C G	3	VI, VIII	II, IV	-
MTH402	Semester Project	Dr Shalini Bhattacharya	4	-	IV	-
MTH420	Semester Project	Dr Shalini Bhattacharya	3	VIII	-	-
MTH421	Commutative Algebra	Dr Souradeep Majumder	4	VIII	IV	-
MTH423	Algebraic Topology	Dr Subhash B	4	VIII	IV	-
MTH424	Partial Differential Equations	Dr Anilamaja Aryasomayajula	4	VIII	IV	-
MTH426	Introduction to Abstract Harmonic Analysis	Dr R Lakshmi Lavanya	4	VIII	IV	-
MTH427	Numerical Analysis	Dr Panchatcharam Mariappan (IIT Tirupati), Dr Gururaja H A (LC)	4	VIII	-	-
MTH441	Operations Research	Dr Kuntal Som (IIT Tirupati) Dr Venketasubramanian C G (LC)	3	VIII	IV	

Physics

PHY302	Semester Project	Dr Sambuddha Sanyal	4		II	
PHY321/621	Quantum Mechanics II	Dr Sambuddha Sanyal	4	VI,VIII	II	Y
PHY322 & CHM321/621	Statistical Thermodynamics	Dr Rakesh S Singh	4	VI,VIII	II	-
PHY323/623	Optics	Dr Jessy Jose* Dr Dileep Mampallil	4	VI,VIII	II	Y
PHY324	Solid State Physics	Dr Koteswar Rao (IIT T) LC Dr Tapan C Adhyapak	4	VI,VIII	II	-
PHY326/626	Nonlinear Dynamics	Prof G Ambika	4	VI, VIII	II,IV	Y
PHY341/641	Fluid Dynamics	Dr Tapan C Adhyapak	3	VI,VIII	II,IV	Y

Course Code	Name of the Course	Name of the Instructor/s	Credits	Sem open in		
				BSMS	iPhD	PhD
PHY342	Quantum Information	Prof M S Santhanam (IISERP) LC Dr Sambuddha Sanyal	3	VI,VIII	II	-
PHY345	Advanced Physics Lab II	Dr Dileep Mampallil*, Dr T Kanagasekaran, PDRF	3	VI	II	-
PHY420	Semester Project	Dr Sudipta Dutta	3	VIII	-	-
PHY421/721	Nuclear and Particle Physics	Dr Chitrasen Jena	4	VIII	-	Y
PHY423/723	Gravitation & Cosmology	Dr Arunima Banerjee	4	VIII	-	Y
PHY424/724	Advanced Condensed Matter Physics	Dr Sudipta Dutta	4	VIII	-	Y
PHY425	Advanced Physics Lab IV	Dr S Sunil Kumar*, Dr Chitrasen Jena	4	VIII	-	-
PHY441/741	Photonics	Dr T Kanagasekaran	3	VIII	IV	Y
PHY443/743	Soft Matter Physics	Dr Ravi Kumar Pujala*, Dr Tapan C Adhyapak	3	VIII	IV	Y
PHY462/762 BIO462/762 CHM462/762 CSA462/762 ECS462/762	Data Science II	Dr Debasish Koner*, Dr Arunima Banerjee	3	VI,VIII	IV	Y
CHM463/763 & PHY463/763	Simulation and Modelling	Dr Padmabati Mondal*, Dr Rakesh S Singh	3	VIII	II, IV	Y

SECOND CONVOCATION

IISER Tirupati conducted its second convocation or graduation ceremony on 25th August 2021 in hybrid mode. Sixty-four students who completed all the academic requirements of the BS-MS program in May 2021 were conferred their Bachelor of Science and Master of Science degrees while one student was awarded a Bachelor of Science degree. Since all graduates could not appear in person due to Covid-19 related travel constraints, the ceremony was held in hybrid mode. Out of 65 graduates, 43 received their degrees in person while the remaining participated online. The Senators participated in person, strictly adhering to the safety norms prescribed during the Covid-19 pandemic.



The IISER Tirupati convocation costumes were designed by the National Institute of Fashion Technology (NIFT), Chennai, a leader in fashion education. The Academic dress designed for the senators is an off-white robe with a red border, and the same robe with a blue border is worn by the chief guest. The dress code for students is a red stole (BS-MS students) or a yellow stole (PhD students) worn over a traditional-style white kurta and pyjama. These knee-length stoles are embroidered with the institute's logo and ornamented with a geometric border pattern of interconnected nodes and branches, based on the concept "Connect: aesthetics informed by science". The border pattern on the robe of senators and the chief guest is based on the concept of "Undulate, to rise and fall, to move in waves, in harmony with nature. The undulated margin signifies that success is achieved through a wave of sustained efforts, despite all odds.



Prof Jyeshtharaj Bhalchandra Joshi, Chairperson, Board of Governors, presided over the function online and introduced the Chief Guest. Prof JB Joshi, Emeritus Scientist, Institute of Chemical Technology, Mumbai is a Fellow of the Indian Science Academies, and Member of National Academy of Engineering, USA. Prof Joshi received the third highest civilian honour, the Padma Bhushan, in 2014 for his services to the field of Chemical Engineering.

Prof K Vijay Raghavan, the Principal Scientific Adviser to the Government of India was the Chief Guest, and delivered his convocation address online to the graduating students, their parents and distinguished invitees. Prof Vijay Raghavan is a Distinguished Professor at the National Centre of Biological Sciences (NCBS), Tata Institute of Fundamental Research Bangalore (TIFR) and was the Director of NCBS till 2013. Prof Vijay Raghavan is a Fellow of the Indian science academies, the Royal Society, the Academy of Medical Sciences (UK) and a Foreign Associate of the US National Academy of Sciences. He was awarded the Padma Shri by the Government of India in 2013.

Director Prof KN Ganesh, as Chairperson of the Senate, awarded the BS and MS degrees to the graduating students. He presented the Institute Gold Medal for Academic Excellence to Thamarai Valli, the Institute Silver medals to Veena Shankar Avadhani and Omkar Vinayak Nippanikar, and the prize for the best graduating student to Bhabesh Kumar Tripathy. Prof Ganesh also presented the report of the institute and addressed the outgoing graduating students, wishing them bright futures. The function ended with a Vote of Thanks by the Registrar Dr CP Mohan Kumar, followed by the National Anthem.

Ms VC Thamarai Valli completed her BS-MS program with a CGPA of 9.5 with specialization in Mathematics. She actively participated in the activities of Math Club, Sports Club and Quiz Club, and functioned as Sports Secretary and Captain of the IISER Tirupati Girls' Basketball Team. She won medals in athletics, Kho-kho and Basketball, and the Best Athlete Award in the Inter-IISER Sports Meet 2017. She is currently pursuing her PhD at University College, London.

Ms Veena Shankar Avadhani completed her BS-MS program with a DST INSPIRE scholarship, and secured the highest CGPA (9.1) among students with specialization in Chemistry. For her summer internships, she worked as a National Initiative on Undergraduate Science (NIUS) Chemistry Fellow, and as Indian Academy of Sciences Summer Research Fellow (IAS-SRF). She was awarded the best poster prize from RSC Advances during the 7th Interdisciplinary symposium on Materials Chemistry (ISMC) 2018. She is currently pursuing her PhD in Chemistry at the University of California, Berkeley.



Mr Omkar Vinayak Nippanikar received his BS-MS degree with a specialization in Physics, with a CGPA of 9.1. He was actively engaged in student's club activities, and coordinated 54 Physics Club sessions over a period of 5 semesters. Omkar plans to pursue a research career in theoretical high energy physics.

Mr Bhabesh Kumar Tripathy completed his BS-MS program with CGPA of 9.0 with specialization in Biology. Bhabesh received the prestigious Khorana Fellowship for Summer Internship at the University of Chicago in 2019. He was a member of IISER Tirupati team that won the Gold medal in iGEM 2019, Boston, USA for the project on 'CoCa coli – Probiotic Immunotherapy for colon cancer using *E. coli*'. He was an active member of Biowissen, and part of IISER Tirupati cricket team in IISM 2018, 2019 and the winning team of ITCL 2018. He plans to pursue a PhD in Biological Sciences.



BS-MS STUDENT PROJECTS

Details of the fifth-year projects carried out by the outgoing batch of BS-MS students during 2020-21.

Due to the COVID-19 pandemic, some of the projects were carried out remotely.

Sl. No.	Name of the Student & Roll No.	Title	Department	Supervisor
1	Bhukya Durga Prasad Naik 201501002	Unraveling the molecular switches governing the priming-induced plant heat stress response(s)	Biology	Dr Annapurna Devi Allu IISER Tirupati
2	Sachin Rathod 201501035	Root On a Chip: Investigating Plant Roots using Microfluidics	Physics	Dr Dileep Mampallil IISER Tirupati
3	Ashish Kumar Majhi 201501038	A local-global principle: Hasse-Minkowski theorem	Mathematics	Dr Venketasubramanian C G IISER Tirupati
4	Maneesha 201501050	Morphological and Molecular Characterization of Root Nodules in Legumes	Biology	Dr Swarup Roy Choudhury IISER Tirupati
5	Ramveer Singh 201601001	Local Class Field Theory	Mathematics	Prof Nagaraj D S IISER Tirupati
6	Sayoojya Prakash 201601002	Obstruction Theory	Mathematics	Dr Subhash B IISER Tirupati
7	Gokul Babu S 201601003	Molecular and Biochemical Characterization of Heterotrimeric G-Protein Signaling in Plants	Biology	Dr Swarup Roy Choudhury IISER Tirupati
8	Jameela Parvin P 201601004	Understanding the transcriptional regulation in <i>Plasmodium falciparum</i>	Biology	Dr Suchi Goel IISER Tirupati
9	Aisha Shigna N 201601005	Genotyping, characterization, and pre-clinical studies on transgenic murine models of colorectal cancer	Biology	Dr Lekha Dinesh Kumar CSIR-CCMB, Hyderabad
10	Sincy P Varghese 201601006	Mechanistic Insights into the Regulation of PBXIP1 Gene Expression	Biology	Dr Sivakumar Vallabhapurapu IISER Tirupati
11	Jayesh Dave 201601007	Non-linear Time series Analysis of Climate data	Physics	Prof G Ambika IISER Tirupati
12	Anushesh Nigam 201601008	Macronutrient Analysis of three-striped Palm Squirrel's Diet	Chemistry	Dr Nandini Rajamani IISER Tirupati
13	Tushar Ranjan Satapathy 201601009	A study of non-AdS holography using the Long String Phenomenon	Physics	Dr Chethan Krishnan IISc, Bengaluru
14	Revathy Menon 201601010	Understanding the significance of bifurcated inter-protein interactions in multi-protein assemblies	Biology	Prof N Srinivasan IISc, Bengaluru
15	Hariharan D S 201601011	A comprehensive study of nearby young open star clusters using Gaia DR2	Physics	Prof Annapurni Subramaniam IIA, Bengaluru
16	Amartya Pal 201601014	Elucidating the role of SOX9 in ovarian cancer stemness and drug resistance	Biology	Dr Sanjay Kumar IISER Tirupati

Sl. No.	Name of the Student & Roll No.	Title	Department	Supervisor
17	Kiran MN 201601015	Studies Directed Towards the Synthesis of Cytotoxic Agent Micromide	Chemistry	Dr Kiran Kumar Pulukuri IISER Tirupati
18	Dibya Saha 201601016	A Study of Hydrolytic Cell Wall Amidases of <i>Mycobacterium smegmatis</i>	Biology	Prof John McKinney and Dr Neeraj Dhar, EPFL, Laussane, Switzerland
19	Akshay Dhan 201601018	An algorithm for Serre's problem on projective modules	Mathematics	Dr AA Ambily CUSAT, Kochi
20	Ardra M 201601019	Chromatin modifier MORC2 regulates HOXA5 expression and function in breast cancer	Biology	Dr Pakala Suresh Babu IISER Tirupati
21	Akhila Ajith 201601020	Visualization of lipids in the excised hippocampus: Discrimination of temporal lobe epilepsy from non-temporal lobe epilepsy	Chemistry	Dr Shibdas Banerjee IISER Tirupati
22	Jikson P Mathew 201601021	Amino Acid Triggered Tuning of Emission Color and Morphology in Lanthanide Doped Upconversion Nanophosphors	Chemistry	Dr Jatish Kumar IISER Tirupati
23	Neethu Abraham 201601023	Non-equilibrium Spin Dynamics using the Discrete Truncated Wigner Approximation	Physics	Dr Sebastian Wüster IISER Bhopal
24	Aparna CK 201601026	Deciphering the role of KLF8 in ovarian cancer progression	Biology	Dr Sanjay Kumar IISER Tirupati
25	Parvathi S Gopinath 201601028	Alterations Induced by Transient Hypoxia in Adult Cerebellar Neurons and Neuronal Cell Lines	Biology	Dr Vasudharani Devanathan IISER Tirupati
26	Arathy Venugopal 201601029	Complex Representations of GL2(Fq)	Mathematics	Dr Venketasubramanian C G IISER Tirupati
27	T Sanjana 201601030	Holographic Tensor Networks and Quantum Error-Correction	Physics	Dr Chethan Krishnan IISc, Bengaluru
28	Vikas Jadhav Y 201601031	Going beyond General Relativity - A new parametrised test of GR using GW observational data from aLIGO detectors	Physics	Dr Anand Sengupta IIT Gandhinagar
29	Subhasree Mal 201601032	Characterisation of the interacting proteins of CTD of testes specific linker histone H1T2/H1FNT	Biology	Prof MRS Rao JNCASR, Bengaluru
30	Swapnil Sanjeev Bhagat 201601033	Identification of patterning mechanisms in early mammalian mesoderm along the anterior-posterior axis	Biology	Dr Ramkumar Sambasivan IISER Tirupati
31	Abhijith K S 201601034	Ruthenium-Catalyzed Acceptorless Dehydrogenative Coupling of Diols with Ammonia Surrogates	Chemistry	Dr Balaraman Ekambaram IISER Tirupati
32	M Kalyani 201601037	Low dimensionally networked perovskites for lighting applications	Chemistry	Dr Janardan Kundu IISER Tirupati
33	Niladri Das 201601038	Multifunctional Materials Based on Iron Oxide Nanoparticles	Physics	Dr Ravi Kumar Pujala IISER Tirupati
34	Ranjitha R 201601040	Understanding the Radical Cation Guanine Evolution within G-quadruplex Structures: A Computational Study	Chemistry	Dr Natacha Gillet CNRS ENS Lyon, France

Sl. No.	Name of the Student & Roll No.	Title	Department	Supervisor
35	Aditya Sharma 201601041	Topics in 2D Conformal Field Theory	Physics	Dr K P Yogendran IISER Mohali
36	K Swetha 201601042	Engineering Nanoparticle-Protein Interactions to Generate Chiral Plasmonic Bioconjugates	Chemistry	Dr Soumit Sankar Mandal IISER Tirupati
37	Riya P Mamachan 201601044	Cohomology of Projective Schemes	Mathematics	Dr Souradeep Majumder IISER Tirupati
38	Omkar Vinayak Nippanikar 201601045	Two-Dimensional Conformal Field Theory and Wess-Zumino-Witten Models	Physics	Dr K P Yogendran IISER Mohali
39	Kapil Patidar 201601046	Electrocatalytic Properties of Graphene Quantum Dots	Chemistry	Prof Vijayamohan K Pillai IISER Tirupati
40	Sahil Datke 201601047	Electronic Properties of Graphene Quantum Fractals	Physics	Dr Sudipta Dutta IISER Tirupati
41	Anza Suneer R 201601048	Functionalized Cyclic Dipeptides as MDR1/ P-gp inhibitors - Revisiting ABC transporter for anticancer leads	Chemistry	Dr Rajesh Viswanathan IISER Tirupati
42	Jitheesh Joy 201601049	Development of New Peptidomimetic Inhibitors Against SARS-CoV-2	Chemistry	Dr Rajesh Viswanathan IISER Tirupati
43	Cheeli Rajesh 201601050	Synthesis and DNA/RNA Hybridisation studies on New isomorphous chiral PNAs: <i>iso</i> -PNA	Chemistry	Prof K N Ganesh IISER Tirupati
44	Bhabesh Kumar Tripathy 201601051	Cell-free chromatin particles trigger mitochondrial damage and ROS production	Biology	Prof Indraneel Mittra ACTREC, Mumbai
45	Veena Shankar Avadhani 201601052	Resolving protein conformational states by a miniaturized ultra-high field asymmetric waveform ion mobility spectrometry	Chemistry	Dr Shibdas Banerjee IISER Tirupati
46	Karthika Krishna Kumar 201601053	Structural changes across yielding and nonlinear stresses in colloidal glasses	Physics	Dr Vijayakumar Chikkadi IISER Pune
47	Sushree Swateeprajnya Behera 201601054	Quantum Volume: Capability of a quantum computer and effective implementation of quantum circuits	Physics	Prof Prasanta K Panigrahi IISER Kolkata
48	Vishnu P 201601055	Evaluation of new natural product derived compounds for the inhibition of <i>Plasmodium falciparum</i>	Chemistry	Dr Suchi Goel IISER Tirupati
49	Nikhitha Nunavath 201601056	Quantum Teleportation -Deterministic and Probabilistic Schemes	Physics	Prof Arun Kumar Pati HRI, Prayagraj (Allahabad)
50	Rajashekar Pathi 201601057	Studies Directed Towards the Total Synthesis of Hemiasterlin	Chemistry	Dr Kiran Kumar Pulkuri IISER Tirupati
51	Mrugank Dake 201601058	Statistical and Machine learning approaches to Squirrel Acoustics	Biology	Dr Nandini Rajamani IISER Tirupati
52	Nikhil Subash 201601059	Development of Nanocomposite Electrodes for Hybrid Energy Storage Devices	Chemistry	Prof Vijayamohan K Pillai IISER Tirupati
53	Amrutha M L 201601061	Circularly Polarised Luminescence in Lanthanide Complexes: Design, Synthesis, and Photophysical Investigations	Chemistry	Dr Jatish Kumar IISER Tirupati

Sl. No.	Name of the Student & Roll No.	Title	Department	Supervisor
54	Yashwant P S 201601062	Synthesis of functionalized heterocycles using photoredox catalysis via acyl radical intermediates	Chemistry	Dr Gopinath Purushothaman IISER Tirupati
55	Uttara Khatri 201601063	Patterns of Sleep from EEG data	Biology	Prof G Ambika IISER Tirupati
56	Rahamdil Usman 201601064	<i>meta</i> C-H Diolefination of mandelic acid derivatives and mechanistic studies	Chemistry	Dr Gopinath Purushothaman IISER Tirupati
57	Athul Joseph 201601067	Nickel Catalyzed Synthesis of β -Amino Alcohols using Borrowing Hydrogen Strategy	Chemistry	Dr Balaraman Ekambaram IISER Tirupati
58	Thamarai Valli VC 201601070	Study of Plane Curves	Mathematics	Prof Nagaraj D S IISER Tirupati
59	Akshara Vincent 201601072	Regularization by viscous perturbation of some PDEs and the inviscid limits	Mathematics	Dr Imran H Biswas TIFR-CAM, Bengaluru
60	Gayathry R 201601073	Numerical simulations of ion dynamics within a 16-pole ion trap and a 16-wire ion trap	Physics	Dr S Sunil Kumar IISER Tirupati
61	Rajalekshmi A R 201601074	Development of High-Performance Charge Storage System based on Anion Intercalation	Chemistry	Dr Vanchiappan Aravindan IISER Tirupati
62	Nayana Pradeep 201601075	Mechanistic insights into PBXIP1 mediated cell survival in cancer	Biology	Dr Sivakumar Vallabhapurapu IISER Tirupati
63	Shamila Minnu K C 201601076	Mechanistic basis of MORC2 chromatin remodeler in mammalian replication stress recovery response	Biology	Prof B J Rao IISER Tirupati
64	Ashish Joy 201601077	Colloidal Glass Transition in two and three dimensions	Physics	Dr Vijayakumar Chikkadi IISER Pune

Details of the fifth-year projects carried out by the outgoing batch of BS-MS students during 2019-20.

Sl. No.	Name of the Student & Roll No.	Title	Department	Supervisor
1	Jessin K Babu 201501001	Manganese-Catalysed Synthesis of N-Methylated Amides and Carbamates	Chemistry	Dr Balaraman Ekambaram IISER Tirupati
2	Anubhav Dhar 201501004	Investigating the role of MORC2, a chromatin remodeler, in cellular replication stress response	Biology	Prof B J Rao IISER Tirupati
3	Abhijeet Behera 201501005	Targeting Stem Cells Dependent Drug Resistance in Ovarian Cancer	Biology	Dr Sanjay Kumar IISER Tirupati
4	Vankanavath Aruna Bai 201501006	Understanding the effect of priming in regulating plant abiotic stress response	Biology	Dr Annapurna Devi Allu IISER Tirupati
5	Rafna Rafeek 201501007	Noise-induced symmetry breaking of self-regulators: An asymmetric phase transition towards homochirality	Chemistry	Dr Debasish Mondal IIT Tirupati

Sl. No.	Name of the Student & Roll No.	Title	Department	Supervisor
6	Kavitha UK 201501008	Deciphering the role of PBXIP1 in Cancer	Biology	Dr Sivakumar Vallabhapurapu IISER Tirupati
7	Abjasree S 201501009	Elliptic flow of light nuclei in Au+Au collisions at $\sqrt{s_{NN}} = 14.5$ GeV	Physics	Dr Chitrasen Jena IISER Tirupati
8	Dania Devassy 201501010	Cell-Cell Communication in Mycobacterium	Biology	Dr Raju Mukherjee IISER Tirupati
9	Karthick Srivatsan 201501012	Martingale Optimal Transportation	Mathematics	Dr Anup Biswas IISER Pune
10	Adithya R 201501014	Deciphering the environmental perception and signalling in <i>A. thaliana</i> root cap cells	Biology	Dr Eswarayya Ramireddy IISER Tirupati
11	Dibin Baby 201501015	Interaction between TCP transcription factors and brassinosteroid signalling pathway in Arabidopsis	Biology	Prof Utpal Nath IISc, Bengaluru
12	Jithen Chandar B 201501018	Deciphering the role of Cytokinin in Plant-Pathogen interactions	Biology	Dr Eswarayya Ramireddy IISER Tirupati
13	Nikita Nilkanth Shinde 201501020	Characterization of protein upregulated in <i>Plasmodium falciparum</i>	Biology	Dr Suchi Goel IISER Tirupati
14	Revathy Sajeev 201501021	Remote (<i>meta</i>) C-H functionalization of mandelic acid derivatives using an easily removable and reusable template	Chemistry	Dr Gopinath Purushothaman IISER Tirupati
15	Nandita V Nair 201501022	On the Feichtinger Algebra of locally compact Abelian groups	Mathematics	Dr R Lakshmi Lavanya IISER Tirupati
16	Swapnil Sanjay Joshi 201501023	Biomimetic Prenylation Reactions and Chemoenzymatic Syntheses Inspired by Nocardioazine Alkaloids	Chemistry	Dr Rajesh Viswanathan IISER Tirupati
17	Shijisha A C 201501024	Evolution of coat colour variation in palm squirrels: An image analysis of museum specimens	Biology	Dr Nandini Rajamani IISER Tirupati
18	Harikrishnan C P 201501025	Impacts of exotic timber tree invasion on a sky island bird community	Biology	Dr Robin V V IISER Tirupati
19	Sonali Shivaji Pawar 201501026	How does our Chemical Intuition of Partial Charges Compare with Quantum Mechanically Derived Charges?	Chemistry	Dr Raghunath O Ramabhadran IISER Tirupati
20	Ashwin P V 201501027	The Role of Gate Insulator for Charge Transport in Organic Semiconductor Field Effect Transistors	Physics	Dr T Kanagasekaran IISER Tirupati
21	Ranadeep Roy 201501028	Aspects of Supersymmetric Conformal Field Theory	Physics	Dr Nemani Suryanarayana IMSc, Chennai
22	Kaushal Jaikumar Pillay 201501029	On testing the no-hair theorem using gravitational waves	Physics	Dr Sanjit Mitra IUCAA, Pune
23	N S Chiranjeevi 201501030	Variation of Vertical Structure of Precipitation in Wet and Dry Spells during the Southwest and Northeast Monsoon Seasons over the Arabian Sea and Bay of Bengal	Physics	Dr K Saikranthi IISER Tirupati

Sl. No.	Name of the Student & Roll No.	Title	Department	Supervisor
24	Aditya Kulkarni 201501031	Cyclic Alkyl(Amino) Carbene Stabilised Pnictinides	Chemistry	Dr Sudipta Roy IISER Tirupati
25	Abiya R 201501032	Dynamical Convergence to Structural Balance in Multiplex Networks	Physics	Dr Sitabhra Sinha IMSc, Chennai
26	Nabadip Choudhury 201501033	Rain with Restart	Chemistry	Dr Debasish Mondal IIT Tirupati
27	Narola Harsh Bharatbhai 201501036	A Modelled Search For Generic Deviations From General Relativity With PyCBC Pipeline	Physics	Dr Anand Sengupta IIT Gandhinagar
28	Shubham Sinha 201501037	Bacteria Motility in Porous Media	Physics	Dr Dileep Mampallil IISER Tirupati
29	Parth Rajauria 201501040	Estimation of discrete-time quantum walk parameters using machine learning	Physics	Dr C M Chandrashekar IMSc, Chennai
30	Anagha Balakrishnan 201501042	Regulation of PBXIP1 gene expression and the role of PBXIP1 gene variants in cancer progression	Biology	Dr Sivakumar Vallabhapurapu IISER Tirupati
31	Viswanath K G 201501044	Machine Learning to Predict Selectivity of Alkyne Hydration	Chemistry	Dr Raghunath O Ramabhadran IISER Tirupati
32	Jalaja Madhusudhanan 201501045	Characterization of Microglial Response to Cortical Stab-injury	Biology	Dr Hiyaa S Ghosh NCBS, Bengaluru
33	Pranav Unnikrishnan 201501046	Explaining the evolution of colour and patterns in squirrels using meta-analyses and experimental approaches	Biology	Dr Nandini Rajamani IISER Tirupati
34	Jayamol P 201501047	Young stellar objects and the Star formation in the W3/W4/W5 Giant molecular cloud complex	Physics	Dr Jessy Jose IISER Tirupati
35	Vyshakh B R 201501051	Thin film flow over inclined plane featuring topography	Physics	Prof Sanyasiraju V S S Yedida IIT Madras

SCIENTIFIC ACTIVITIES OF SCHOLARS

This is a list of publications, presentations and events attended by scholars and staff at IISER Tirupati that do not involve its faculty. This includes independent scientific research and research work carried out through collaborations outside of IISER Tirupati. The list also includes summer internships and research visits to other organisations by students.

BS-MS STUDENTS

Avadhani, Veena Shankar

Avadhani, V S, & Sen, I. D. (2021). Interaction of imidazolium chloride-based ionic liquids with Triton X-114 micelles. *Journal of Molecular Liquids*, 339. <https://doi.org/10.1016/j.molliq.2021.116836>

More, Prasanna

Salame, P, Kotalgi, K, Devakar, M, & **More, P** (2022). Electronic transport properties of NASICON structured $\text{NaFe}_2(\text{PO}_4)_2(\text{SO}_4)_2$: A potential cathode material for Na-ion batteries, synthesized using ultrasound-assisted, indirect microwave heating technique. *Materials Letters*, 313. <https://doi.org/10.1016/j.matlet.2022.131763>

Nunavath, Nikhitha

Nunavath, N, Arjun, H K, Behera, B K, & Panigrahi, P K (2022). Observation of a discrete time crystal on a digital quantum simulator. *Quantum Studies: Mathematics and Foundations*, 9(2), 199-209. <https://doi.org/10.1007/s40509-021-00264-8>

Rafeek, Rafna

Rafeek, R, & Mondal, D (2021). Noise-induced symmetry breaking of self-regulators: Nonequilibrium transition toward homochirality. *Journal of Chemical Physics*, 154(24). <https://doi.org/10.1063/5.0053856>

Roy, Triptesh Kumar

Roy, T K, Sreedharan, R, Ghosh, P, Gandhi, T, & Maiti, D (2022). Ene-Reductase: A multifaceted biocatalyst in organic synthesis. *Chemistry - A European Journal*, 28(21). <https://doi.org/10.1002/chem.202103949>

Participation in Conferences (National & International)

R Anirudh 201801147

Presentation at the 7th Southern Regional Astronomy Meeting.

Hassan Abdul Basheer 20191009

Indian Science Festival in IISER Pune in 2019

Prarthana Agrawal 201801096

(international) APS Conference for Undergraduate Women in Physics (CUWIP 2022) organised by APS Physics

Shivam Kumar 20191128

Participated in ICTS: Neuroscience, Data Science, and Dynamics, a discussion meeting conducted online, February 7-10, 2022.

Swastik D Shinde 201801178

Presentation on "CAMS India: A new video camera network for monitoring meteor shower activity." at the Science showcase Sci-ROI@India Virtual Meet | SETI outreach event: "Updates on CAMS India and how it can affect global observations." | Presentation on "CAMS India: A new video camera network for monitoring meteor shower activity." at the IPSC (Indian Planetary Science Conference) organized by PRL.

Fathima Aslaha T R 20191007

International Conference On Insect Systematics And Evolutionary Biology 3 (ISEB 3), between 16-18 Feb 2022.

PS Vishnuprasad 201701003

14th International ACM Conference on Web Science in 2022.

Lochan Chaudhari 20191027

ICTSGS 1 international conference held by SPAST Foundation.

Bijas N 201701038

3rd meeting on star Formation titled "Star formation studies in the context of NIR instruments in 3.6 m DOT" from 04-07 May 2022, ARIES, Nainital, India.

iGEM 2021 team

The iGEM 2021 team of IISER Tirupati was nominated for the iGEM Safety & Security award, and thus, were invited to the Meeting of States Parties to the Biological Weapons Convention to highlight the 'Safety & Security' aspects of our project on 22nd November 2021. This an international conference organized by the United Nations Office for Disarmament Affairs. We were invited to represent iGEM and the values of safety we demonstrated through our project as a part of your youth engagement event at the BWC 2021.

Sahyadri Devidatt Krishna 201701075

Poster Presentation at ESA-ECMWF Conference 2021 | Presentation at Space and AI, 2021, organised by ESA and CLAIRE | Poster presentation at 53rd Lunar and Planetary Science Conference (LPSC), 2022 - (<https://www.hou.usra.edu/meetings/lpsc2022/pdf/2713.pdf>) | Student Volunteer at 38th Annual Meeting of the Astronomical Society of India (ASI), 2020.

Abirami Menath 201801035

Animal Behaviour Live seminar series 2021 | Animal Behaviour Live seminar series 2022 | International Webinar Series on Amphibian Research (2nd March 2022)

E Lakshmi 201801140

Online SPARC Indo US International Immunology workshop

Details of summer internships

Prakriti Parthasarathy 20191039

IAS SRFP fellowship in computational neuroscience with Prof US Bhalla at NCBS in summer 2022.

R Anirudh 201801147

One of six students selected for the 3rd European Southern Observatory Summer Research Programme 2021

Ainesh Sanyal 20191068

IASc-INSa-NASi Summer Research Fellowship Programme (SRFP) 2021 Guide: Prof P Ramadevi, IIT Bombay.

Athira Anil 201801112

Summer internship with Dr Arun Kumar, IISER Berhampur on "Comparative and Evolutionary Genomics"

Ishita Amar 201701034

May '19-June '19: Indian Academy of Sciences Summer Research Fellowship with Dr Mausumi Bharadwaj, NICPR NOIDA. May 21-July '21: Internship with Dr Sreenivas Chavali, IISER Tirupati

Arya Krishna T 201701072

Molecular Biology Project, Bangalore University

Hassan Abdul Basheer 20191009

At LARC in Qatar University

Himika Das 20191077

In-person internship at the Computing Science department of Umea University, Sweden, with Dr Monowar Bhuyan in the Autonomous Distributed Systems lab.

Hrudya Sundareshan 201801078

An unofficial reading project on conservation biology with Dr Sharachchandra Lele from ATREE

Megha Maria Jacob 201701022

Internship at the University of Kerala with Dr Achuthsankar Nair.

Cyriac Raju 20191085

Internship with Prof Nirmal K Vishwanathan, Beam Optics and Applications Group, School of Physics, University of Hyderabad, on automation of experiments using Python programming.

Spoorthy Gowda 201701076

Worked in IISc Bangalore for two summers.

Koushik Kumar Maiti 20191056

Internship with Dr Divya Goel, Assistant Professor, Department of Mathematical Science, IIT Varanasi (BHU); on Functional Analysis

Riya Batra 201801029

Summer internship at ICRISAT (The International Crops Research Institute for the Semi-Arid Tropics), Hyderabad

Aditi Asati 20191115

Modelling and Experimentation of Singing Neural Network in IISER Pune

Reva T 20191122

Internship with Dr Kavita Isvaran, Center for Ecological Sciences, Indian Institute of Science

Prarthana Agrawal 201801096

Internship with Dr Sambuddha Sanyal at IISER Tirupati

Yash Wath 20191010

QWorld's QIntern Program - July-August 2021 (led to preprint mentioned above) | Project Intern at TCS Research and Innovation Lab (Jan 2022 - March 2022) | IASc-INSa-NASi Summer Research Fellowship at IIST Tvm (May 2022- present)

Mrigaraj Goswami 201701057

IAS-SRFP in 2019, worked at CECRI Karaikudi with Dr M Sathish

Shivam Kumar 20191128

Summer Research Fellowship by the Academy of Sciences at the Indian Institute of Technology Gandhinagar, to study the Extensional rheometry with a handled mobile device with Prof Prachi Thareja

K S Apsara 20191020

Summer Internship at NARL, Tirupati with Dr TN Rao as a part of SRFP by Indian Academy of Science on period of 56 days from May 23, 2022 | Internship with Dr Jessy Jose IISER Tirupati on 'Identification of Propylid like objects on Cygnus OB2, during summer break 2021

Ashesh Abhisek Khatua 20191066

With Dr Eswaraiha Chakali in the field of Magnetic field in Interstellar Medium | Summer Internship with 2021 with Dr Abhirup Datta at IIT Indore in the field of Radio Astronomy.

Sriyukta G Cheeranghat 201801056

Internship at NCBS (2019)

Bhabesh Kumar Tripathy 201601051

Khorana Program 2019 at the University of Chicago

Lakshmi Vedasamhitha Peesapati 20191104

Summer internship with Dr Sambudha Sanyal at IISER Tirupati, studying chaos in spin glasses

Esha S Babu 201801165

2019 Summer internship at IIT Palakkad with Dr Dinesh Jagadeesan, on the Synthesis and characterization of perovskite catalysts

Lakshmi MV 20180113

Online internship with Dr Ananya Lahiri, IIT Tirupati

Adarsh S 20191053

On Symplectic Groups at CUSAT(Cochin University of Science and Technology), advisor Dr A A Ambily [during May 16 - July 15, 2022]

Kanthi M P 20191004

Summer Research Fellowship Programme(SRFP- IASc, INSA, NASI) 2021 in Life Science under Prof: Alo Nag, Delhi University, South Campus. Worked on a project titled "Elucidation of E6 binding sites on human adaptor protein-hADA3 and targeting E6-hADA3 interaction to reduce tumorigenicity in HPV positive carcinomas."

Marwa Abdul Razak 20191110

Summer internship with Dr Maria Thaker's Lab, IISC from 25th May to July

Fathima Aslaha T R 20191007

Internship in Paleopathology with Dr Niraj Rai at the Birbal Sahni Institute of Paleosciences (BSIP), as a part of the Birbal Sahni Summer Internship Program

Rajeshree Rajesh Umbarkar

Summer internship with Dr Suchi Goel, IISER Tirupati | Training with Dr AP Kopulwar, Dept of Biotechnology at PIET Nagpur

Amrutha Balakrishnan 20191143

At IISc Bangalore Biochemistry department with Dr Saravanan Palani; May-June 2021

PS Vishnuprasad 201701003

Extended thesis project since May 2021 at the University of Applied Sciences and Arts of Southern Switzerland in Lugano with Dr Luca Luceri and Prof Silvia Giordano.

Lochan Chaudhari 20191027

Online review paper writing internship at Research Bulb in 2021
(<https://drive.google.com/drive/folders/15AvNEe46hZhXk1Dg5pgov76BRhQGQ3-g>)

Prameya Garge 20191084

Internship with Dr Nandini Rajamani, IISER Tirupati

Shubhra Singhal 20191038, Shreyas Samir Parkhie 20191126

Received the Lakshmi Mittal and Family South Asia Institute, Harvard University. The 10,000 USD grant was

awarded to us for our project India EATS which aims to eradicate anemia from India through sustainable and alternative method of using Iron fortified Spirulina. We received this award along with Mr Kumaresh Krishnan, who is currently pursuing a PhD at the Florian Engert Laboratory, Harvard University.

Bijas N 201701038

Summer internship at the University of Kerala (May-June, 2018), and at IIT Madras (May-June, 2019)

Shreyas Samir Parkhie 20191126

Part of the Seed for Change Grant 2021 | Recipient of Emerging Leaders in Contraceptive Technology Innovations conducted by CTI Exchange under the guidance of Prof Jeffrey Jensen, Professor of Obstetrics and Gynecology at Oregon Health and Science University and a constant members of CTI Exchange Youth Council.

Saunak Bhattacharjee 20191093

Summer Research Program in Mathematics at The Institute Of Mathematical Sciences, Chennai

Gayathri PS 201801048

Complex Systems with Dr Jankai Balakrishnan, IAS-- Summer 2022

Devika G 201801144

Learning techniques in Molecular Biology, Jubilee Mission Research Centre, Thrissur, Kerala, with Dr Suresh Kumar

Sahyadri Devidatt Krishna 201701075

Since January 2021; Mentor: Siddha Ganju, Nvidia/NASA Frontier Development Lab (NASA FDL); Title - "Cameras for All-sky Meteor Surveillance (CAMS) (A NASA-funded project led at the SETI Institute)"

Akshaya Keerthi C S 201701033

At CUSAT Department of applied chemistry under Associate professor Dr N Manoj.

Harsha K H 20191079

Summer internship at IIT Palakkad, Physics department, Topic - Star formation

Sanskar Agrawal 20191028

SPIM 2022 at Harishchandra Research Institute, Prayagraj and MTTS 2022 at IISER Thiruvananthapuram

Abirami Menath 201801035

Summer Internship 2021 with Dr VV Robin, IISER Tirupati, Andhra Pradesh, India

T Souparnika Sabu 20191083

Summer internship under Dr Kalika Prasad at IISER Pune, on the topic molecular mechanisms regulating touch dependent organ regeneration

E Lakshmi 201801140

BODIPY: synthesis and validation, Organic Chemistry lab, NITC

INTEGRATED PhD STUDENTS

Publications

Bajaj, Mayur

Acharya, P P, **Bajaj, M**, Irle, H, & Banerjee, P (2021). An Occam's razor: Synthesis of osteoinductive nanocrystalline implant coatings on hierarchical superstructures formed by *Mugil cephalus* skin hydrolysate. *Process Biochemistry*, 111, 278-296.

<https://doi.org/10.1016/j.procbio.2021.11.006>

Banerjee, P, & **Bajaj, M** (2021). A study on ancient artifacts around Badami hill and their correlation with the natural rock arch of Sidlaphadi. *Ancient Asia*, 12.

<https://doi.org/10.5334/aa.215>

Conference Details

Sharang Rav Sharma 20192405

The 8th Asian Triangle Heavy-Ion Conference (ATHIC2021) at South Korea [Virtual, 5th - 9 Nov 2021].

European Physical Society (EPS) conference on high energy physics 2021 by Universität Hamburg and by the research center DESY. [Virtual, 26-30 July 2021].

Derek Cyrus Gomes 20182402

Soft Matter: Young Investigator's e-Meet (e-SMYIM 2021), October 14 - 16, 2021 : Organizing Institutes - IIT Bombay, IISc. Bangalore, IISER Tirupati.

Sreejani Karmakar 20182407

National Conference on Low Dimensional Materials (LDMAT-2021) June 2nd - 4th, 2021

Priyanshi Sinha 20182405

Quark matter 2022 (April 4-10, 2022); Poster presentation on "anisotropic flow of phi mesons in Au+Au collisions at centre of mass energy of 19.6 GeV in RHIC-BES II program"

Mizna KA 20192402

May 4-7 . 3rd meeting on star formation, ARIES, Nainital.

Rishabh Sharma 20182406

STAR Collaboration Meeting (Sep 16, 2021), STAR Collaboration Meeting Sep 2022 (Feb 15, 2022), Quark Matter (April 8, 2022), ALICE-STAR India Collaboration Meeting (April 27, 2022)

Ambareesh Shrivastav 20182401

- Soft Matter Young Investigators' e-Meet 2021 (Online) - held from 14th to 16th October 2021, organised by IIT Bombay, IISc Bangalore and IISER Tirupati.
- Presented in "Mini Talks" on the topic "Hydrodynamics of flagellated microswimmers in confined fluids"

Seminar

Sharang Rav Sharma 20192405

Free Meson Seminar at TIFR India [07 Oct, 2021]

Priyanshi Sinha 20182405

- How many parameters for the universe"? by Prof Supratik Pal (31-3-22);
- The 1st RHIC-BES online seminar (Series III) on Sept. 14, Luciano Musa "ALICE physics prospects for LHC Run 3 and beyond"
- Gave open seminar on "Novel phenomena in high multiplicity small collision systems " on 29th June 2021
- "Gaseous detectors: State-of-the-art and future perspectives" by Dr Archana Sharma, Principal Physicist, CERN, Geneva on 21/03/2022
- "Thermodynamics of strong interacting matter from Lattice QCD calculations" by Dr Frithjof Karsch, Bielefeld University, Germany on 22/04/2022
- "Search for the Chiral Magnetic Effect in isobar collisions at RHIC" by Prof Sergei A Voloshin Professor, Department of Physics and Astronomy Wayne State University, Detroit on 30th September 2021

Rishabh Sharma 20182406

Free meson seminar (07 October, 2021), Free meson seminar (April 21, 2022)

Workshop Details

Anjali Kumari Singh 20182104

Biostatistics: A User's Perspective, by IISER Pune (8th to 16th January 2022)

Sharang Rav Sharma 20192405

IV ALICE-India School on Quark-Gluon Plasma 2021 at Bose Institute [Virtual, 8-20 Nov 2021].
SSI 2021 - SLAC Summer Institute 2021 at Stanford University [Virtual, 16-27 Aug 2021].
International workshop on High-Performance Computing 2021 at IISER TVM [Virtual, 16-17 August 2021].

Derek Cyrus Gomes 20182402

Bangalore School on Statistical Physics -XII, June 28 - July 09, 2021 ;
Organizing Institute - ICTS-TIFR

Priyanshi Sinha 20182405

Won 2nd prize for "Best student award" in the 4th ALICE-India school on Quark-Gluon Plasma-2021 organized by the ALICE-India collaboration hosted virtually by Bose Institute from 8th - 20th November, 2021

M Anupama Devi 20192105

Online Course: Wildlife Population Estimation and Related Topics, 10th May - 7th June 2021
Instructor: Devcharan Jathanna, PhD. Wildlife Conservation Society-India

Rishabh Sharma 20182406

ALICE-India school (Nov 8, 2021 to Nov 20, 2021)

Gunjan 20182107

- 3D Illustration for Science Communication Using Blender. Organized by Scidart Academy (24th March to 29th March, 2022)
- Bioimage Analysis Workshop - Images 2 Numbers. Organized by JNCASR (16th August to 26th August, 2021)
- How to write CV and Cover Letter for academic and industrial jobs. Organized by Careerdevforum (19, 20th February, 2022)

Ambareesh Shrivastav 20182401

Attended "Bangalore School on Statistical Physics - XII (online)", organised by ICTS Bangalore from 28th June 2021 to 9th July 2021

PhD STUDENTS

Publications

Kumar, Harsha

Kumar H., Joshi V., Rajan A. & Lele A. 2021. First reports of Alida Angle from Tirupati. Zoo's Print. 10(10): 22- 24.

Roy, Dyuti

Ramapriya, D M, Barman, T, Appaiah, M, & Roy, D (2021). A review of the Wigner distribution function approach to analyse electromagnetic field. *Journal of Electromagnetic Waves and Applications*, 35(14), 1939-1957.
<https://doi.org/10.1080/09205071.2021.1924293>

Conference details

Krishna K Das 20183107

Online meeting- University of Missouri, Colombia, USA
 May 24-28, 2021

Abin P George 20203104

11th Symposium of the International Society of Root Research and Prestigious Ambassador Program

Sapana Sharma 20183101

Experimental pain research lab, Heidelberg University, Germany (17th March 2022 - On going)

Salvi M 20173401

Ernst-Mach worldwide scholar for 01/02/2021 to 31/07/2021 at University of Innsbruck (Prof. Roland Wester's Research Group)

Surya Narayana Sangitra 20183406

e-SMYIM 2021, 14-16 October 2021 | Soft Matter Day (one day symposium), IISER Tirupati, 30 October 2021 | Online CONFERENCE ON MATHEMATICS AND PHYSICS OF FLUIDS (MPFLUIDS 2021), 1-3 November, 2021 | Virtual COMPFLU 2021, 13 -15 Dec 2021

Vignesh B 20193404

Soft Matter Young Investigators e-Meet 2021: 14th -16th October 2021

Catherine Tom 20193401

Oral and Poster presentation on the topic "Binary Mixtures of Colloidal Cellulose Nanocrystals and Laponite for Preparation of Functional Nanocomposites" | CompFlu 2021 (International conference on complex fluids and softmatter - virtual CompFlu) - 13-15 December, 2021 | Oral and Poster presentation on the topic "Self assembly of anisotropic colloids" - SMYIM 2021 (Soft Matter: Young Investors e-meet) - 14-16 October, 2021

Sivakumar G 20193218

JNOST-22 organized by school of chemistry, UoH, Hyderabad. 06-09 January 2022

Krishna K Das 20183107

11th Symposium of the International society of root research, May 24-28 2021.

Abin P George 20203104

May 24 - 28, 2021, Virtual Meeting, Hosted by the University of Missouri, Columbia, Missouri, US

Gopu Maheshwar Reddy 20193409

Soft Matter: Young Investigators e-Meet 2021, organised by IIT-Bombay and IISER-Tirupati (Virtual mode), Oct. 14-16 2021. Mini talk on "Evaporative Self-Assembly of Emulsion"

Sudeshna Patra 20183405

7th Southern Regional Astronomy Meeting, Research in Astronomy: Opportunities and Challenges.
 Talk: Outer Milky Way: Best Landscape to study the Effect of Environments on Star Formation Date: 8-10 September, 2021

Sneha Kachhara 20193408

Networks 2021, July 5-10, 2021
 2. 10th International Conference on Complex Networks and their Applications, 2021 (Nov. 30-Dec. 2, 2021)

Reshma R 20193105

Synapse-2021: 3rd & 4th Dec 2021

Arunima Verma 20213208

NCMMS 2022 (National Conference on Molecular Modelling and Simulations)

Soumyadip Ray 20203201

Theoretical Chemistry Symposium, December 2021

Souren Adhikary 20173403

MANA Symposium 2021,

Divya ML 20183208

Review Meeting-SEC-ETD held on 28 September, 2021 by KIRAN DST

Krishan Gopal 20173406

STAR Collaboration Meeting, 14-25 Feb 2022,
2. ALICE India Collaboration Meeting, 17-20 Aug 2021,
3. STAR Collaboration Meeting- September 2021

Salvi M 20173401

Poster presentation (Title: Towards gas-phase spectroscopic studies of [dAMP-H]⁺ in Cryogenic 16-pole ion trap, Authors- Salvi Mohandas, Franziska Dahlmann, Eric Endres, Sunil Kumar S, and Roland Wester)
Å-PG-SPG conference at University of Innsbruck,
30/08/2021-03/09/2021

Subramanyan K 20183213

IOP publishing, Environmental research 2021, Oral Contributor, 15-19 November 2021, Title - Facile recycling technique to recover copper oxide and graphite anode materials for sodium-ion battery from discarded lithium-ion battery

Swati Udayraj 20183106

Attended National Conference on Citizen Science for Biodiversity, 13th - 16 September 2021

Archita Sharma 20213112

Presented Poster at National Symposium on Avian Biology (March 30-31, 2021)

Maria Francis 20183201

27th CRSI National Symposium in Chemistry; 26.09.2021 to 30.09.2021

Seminars

Surya Narayana Sangitra 20183406

Webinar by Anton Paar India on Electrorheology and Rheology Date - 06 July 2021

Vignesh B 20193404

Soft Matter Day 2021, IISER Tirupati: 30th October 2021

Krishna K Das 20183107

Presented in the virtual symposium of Global Reach 2021 conducted by Dalhousie University, July 21-22, 2021

Sudeshna Patra 20183405

CMZOOM talk series (focusing on star formation in the Central Molecular Zone)
DAA-TIFR Seminar Series

Sathiri Jagadeesh 20183113

Nucleic acid secondary structures: G4s and beyond. Dates January 27, 2022, February 03, 10, 17, 24, March 03, 10, 17, 24, 31, 2022.

Shruti Shree 20213109

Synapse 2021, Neuroscience Symposium, 3-4 Dec 2021

Kulbir 20193219

REAXYS: A tool for Literature Search and Retrosynthesis of Chemicals and Pharmaceuticals.â€ organized by Amity School of Engineering and Technology, Amity University Madhya Pradesh, Gwalior on 26 February 2022.

Arunima Verma 20213208

Theoretical chemistry symposium December 2021

Souren Adhikary 20173403

LDMAT-2021

Divya ML 20183208

- Webinar on Advanced Nanomaterials for Energy Sector Applications held on 17th Sep 2021
- Talk to Experts on Modern Scanning Electron Microscopy (FESEM) held on Feb 01, 2022 organised by INSTEM

Krishan Gopal 20173406

- Thermodynamics of strong interacting matter from Lattice QCD calculations (Dr Frithjof Karsch, Bielefeld University, Germany) 22/04/2022
- ALICE 3: a next-generation heavy-ion experiment for the LHC (Dr Marco van Leeuwen, Senior Scientist, Nikhef (NL), Amsterdam, Netherlands) 03/02/2022
- Search for the Chiral Magnetic Effect in isobar collisions at RHIC (Prof Sergei A Voloshin, Professor, Department of Physics and Astronomy, Wayne State University, Detroit, Michigan (USA)) 30/09/2021
- In-Medium T-Matrix Approach for Heavy Quarks and the sQGP (Prof Ralph Rapp, Professor of Physics, Texas A&M University, USA) 23/06/2021
- Gaseous detectors: State-of-the-art and future perspectives (Dr Archana Sharma, Principal Physicist, CERN, Geneva) 21/03/2022

Workshop Details

Vignesh B 20193404

Bangalore School on Statistical Physics XII (Online) 28th June - 9th July 2021

Anoop Ramachandra Bhat 20213111

IISER Pune Biostatistics, January 2022

Chetiyar Vaishnavi Varadarajan 20193116

How to write CV and Cover Letter for academic and

industrial jobs (19th and 20th February, 2022); 3D Illustration for Science Communication using Blender (24th to 27th March, 2022)

Gopu Maheshwar Reddy 20193409

- Basic Training Program in Nano Science and Technology, organised by Centre for Nano Science and Engineering, IISc, Bangalore (Virtual mode). May 10-12 2021.
- Graduate school on Soft Solids and Complex Fluids 2021 [SSCF-2021], organised by University of Massachusetts Amherst (Virtual mode). Jun. 01-04 2021
Sound bites(Talk) on "Collective motion of micro-droplets"

Sudeshna Patra 20183405

The Future of Airborne Infrared/Submm Astronomy
Date: 26-28 July, 2021

JWebbinar5 : MIRI and NIRSpec IFU, Space Telescope Science Institute, USA Date: 28 June, 2021

Sathiri Jagadeesh 20183113

RNA imaging and intracellular dynamics workshop. April 26, 2022.

Reshma R 20193105

ML Workshop 2021: July 26th to July 30th 2021

Kulbir 20193219

Mendeley: Software tool training. Organized by Amity School of Engineering and Technology, Amity University Madhya Pradesh, Gwalior on 26 February 2022.

Soumyadip Ray 20203201

Electronic Structure Theory And Application To Chemical Systems, 02-06 Nov, 2020

Souren Adhikary 20173403

BESC2022, January 10 - 12, 2022

Latika Joshi 20213116

Biostatistics Online Course from IISER Pune, 8th to 16th January 2022

Anoop Ramachandra Bhat 20213111

Biostatistics Workshop conducted by IISER Pune, January, 2022

Sanjeev Kumar Pandey 20173301

Finite groups of Lie type (2021) (31st July - 3rd Oct.) held at IISER Pune

Swati Udayraj 20183106

Online Course: Wildlife Population Estimation and Related Topics, 10th May - 7th June 2021
Instructor: Dr Devcharan Jathanna, Wildlife Conservation Society-India

Archita Sharma 20213112

Online Course: Wildlife Population Estimation and Related Topics, 10th May - 7th June 2021
Instructor: Devcharan Jathanna, PhD. Wildlife Conservation Society - India

POST-DOCTORAL RESEARCH FELLOWS/ PROJECT FELLOWS

Publications

Aglawe, Supriya Babasaheb

Aglawe, S B, Verma, A K, & Upadhyay, A K (2021).

Bioinformatics tools and databases for genomics-assisted breeding and population genetics of plants: A review.

Current Bioinformatics, 16(6), 766-773.

<https://doi.org/10.2174/1574893615999200831144028>

Das, Swagat

- Potdar, A, **Das, S R**, Issac, N et al. (2021). Galactic H ii region IRAS 17149 – 3916 – a multiwavelength study. *Monthly Notices of the Royal Astronomical Society*, 510(1), 658-673. <https://doi.org/10.1093/mnras/stab3479>

- Pandey, R, Sharma, S, Dewangan, L K, ... **Das, S** et al. (2022). Sh 2-301: A blistered H ii region undergoing star formation. *The Astrophysical Journal*, 926(1). <https://doi.org/10.3847/1538-4357/ac41c3>

Kumar, Brawin

- Kumar B Rare animals of Eastern Ghats, India (கிழக்கு மலைத்தொடரின் அருகிவரும் உயிரினங்கள்) – Essay published in The Hindu Tamil Newspaper on 27th November 2021. 1. <https://www.hindustamil.in/news/supplements/uyir-moochi/741339-eastern-range.html>
- Kumar B Hedgehogs in Peril (கேள்விக்குறியாகும் முள் எலிகளின் எதிர்காலம்...) – Essay published in Dinamalar newspaper on 13th December 2021

Mandal, Ankur

Mandal, A, Deshmukh, P C, & Singh, K P (2021).

Controlling high harmonic generation using inhomogeneous two-color driving laser pulse. *Laser Physics*, 31(7). <https://doi.org/10.1088/1555-6611/abfe55>

Manikandan, S

Manikandan, S, & Singh, A (2022). A criterion for the existence of logarithmic connections on curves over a perfect field. *Indian Journal of Pure and Applied Mathematics*, 53(2), 330-339. <https://doi.org/10.1007/s13226-021-00008-9>

Mukherjee, Arijit

Morye, A S, & Mukherjee, A (2022). On the structure of the algebra generated by the rational equivalence classes of Brill–Noether loci in the Chow ring of the moduli space of semistable bundles on elliptic curve. *Indian Journal of Pure and Applied Mathematics*.

<https://doi.org/10.1007/s13226-022-00228-7>

Natesh, Meghana

- Sagar, V, Kaelin, C B, Natesh, M et al. (2021). High frequency of an otherwise rare phenotype in a small and isolated tiger population. *Proceedings of the National Academy of Sciences*, 118(39). <https://doi.org/10.1073/pnas.2025273118>

- Thatte, P, Tyagi, A, Neelakantan, A, Natesh, M, Sen, M, & Thekaekara, T (2021). Trends in wildlife Connectivity Science from the Biodiverse and Human-Dominated South Asia. *Journal of the Indian Institute of Science*, 101(2), 177-193. <https://doi.org/10.1007/s41745-021-00240-6>

Pulikanti, Guruprasad Reddy

(Book Chapter)

Kumar, R, Pulikanti, G R, Shankar, K et al. (2022). Surface coating and functionalization of metal and metal oxide nanoparticles for biomedical applications. In K. Mondal (Ed.), *Metal Oxides for Biomedical and Biosensor Applications* (pp. 205-231). Elsevier. <https://doi.org/10.1016/B978-0-12-823033-6.00007-7>

Sarkar, Suman

- Pandey, B, & Sarkar, S (2021). Testing homogeneity of the galaxy distribution in the SDSS using Renyi entropy. *Journal of Cosmology and Astroparticle Physics*, 2021(7). <https://doi.org/10.1088/1475-7516/2021/07/019>
- Das, A, Pandey, B, & Sarkar, S (2021). Green valley galaxies in the cosmic web: Internal versus environmental quenching. *Journal of Cosmology and Astroparticle Physics*, 2021(6). <https://doi.org/10.1088/1475-7516/2021/06/045>
- Sarkar, S, Pandey, B, & Das, A (2022). On the origin of red spirals: Does assembly bias play a role? *Journal of Cosmology and Astroparticle Physics*, 2022(3). <https://doi.org/10.1088/1475-7516/2022/03/024>

Sarvagalla, Sailu

(Book Chapter)

- Kondapuram, S K, Sarvagalla, S, & Coumar, M S (2021). Docking-based virtual screening using PyRx tool: Autophagy target Vps34 as a case study. In M. S. Coumar (Ed.), *Molecular docking for computer-aided drug design: Fundamentals, techniques, resources and applications* (pp. 463-477). Elsevier Academic Press. <https://doi.org/10.1016/B978-0-12-822312-3.00019-9>
- Sarvagalla, S, Kondapuram, S K, Devi, R V, & Coumar, M S (2021). Resources for docking-based virtual screening.

In M. S. Coumar (Ed.), *Molecular docking for computer-aided drug design: Fundamentals, techniques, resources and applications* (pp. 179-203). Elsevier Academic Press. <https://doi.org/10.1016/B978-0-12-822312-3.00002-3>

Selvarasu, Praneetha

Garten, L M, Selvarasu, P & Perkins, J, Ginley, D, & Zakutayev, A (2021). Phase formation of manganese oxide thin films using pulsed laser deposition. *Materials Advances*, 2(1), 303-309. <https://doi.org/10.1039/D0MA00417K>

Tirumani, Srikanth

Srinivasan, R, Subramanian, P & Tirumani, S, Gothandam, K M, & Ramya, M (2021). Ectopic expression of bacterial 1-aminocyclopropane 1-carboxylate deaminase in *Chlamydomonas reinhardtii* enhances algal biomass and lipid content under nitrogen deficit condition. *Bioresource Technology*, 341. <https://doi.org/10.1016/j.biortech.2021.125830>

Conference Details

Kumar, Brawin

CitSci India 2021 Virtual Conference: 13-16 September 2021.

Workshop Details

Kumar, Brawin

Conservation Leadership Course online between 5th – 16th July 2021, organized by EDGE and Zoological Society of London, UK.

TECHNICAL STAFF

Publications

Raju, Donempudi Siva

- Raju, D S, Rajesh, M, Bindu, S H et al. (2021). Spectral investigations of trivalent Europium (Eu³⁺) ions doped ZnBiNaPSr oxyfluoride glasses for visible photonic device applications. *Rasayan Journal of Chemistry*, 14(4), 2392-2405. <https://doi.org/10.31788/rjc.2021.1446523>
- Raju, D S, Raju, B D P, Bindu, S H, et al. (2021). Spectral investigations of dysprosium (Dy³⁺) ions doped ZnBiNaPSr oxyfluoride glasses for intense white light emitting diodes (w-LEDs). *Materials Today: Proceedings*, 47, 4364-4372. <https://doi.org/10.1016/j.matpr.2021.05.087>
- Hemalatha, M, Raju, D S, & Krishna, V V, & Raju, C L (2021). Synthesis and characterization of nanorods in

PVALiAgSe:Cu²⁺ composite films–Effect of copper concentration and alkali chlorates on the composite films. *Journal of Crystal Growth*, 568-569.
<https://doi.org/10.1016/j.jcrysgro.2021.126186>

- Hemalatha, M, Vinay, V K, & **Raju, D S**, & Raju, C L (2021). Spectral studies on impact of Alkali Perchlorate (Li/Na/K-ClO₄) Salts on the properties of PVA-Ag-Cr³⁺ Polymer Nanocomposite Films. *Journal of Physics: Conference Series*, 2070(1).
<https://doi.org/10.1088/1742-6596/2070/1/012077>
- Krishna, J S, **Raju, D S** & Krishna, V V et al. (2021). Preparation and characterization of copper (Cu²⁺) ions doped Zincaluminoborophosphate (ZnAlBP) glasses. *Journal of Physics: Conference Series*, 1913(1).

<https://doi.org/10.1088/1742-6596/1913/1/012013>

- Krishna, V V, Bindu, S H, **Raju, D S**, & Raju, C L (2021). Judd-Ofelt, radiative properties of Sm³⁺ ions doped PVA+PEG complex polymer films from spectral analysis. *Journal of Physics: Conference Series*, 1913(1).
<https://doi.org/10.1088/1742-6596/1913/1/012010>
- **Raju, D S**, Bindu, S H, Krishna, J S et al. (2021). Synthesis and structural analysis of trivalent Europium (Eu³⁺) ions doped oxyfluoride (ZnBiNaPSr) glasses as prominent host materials for optical devices. *Journal of Physics: Conference Series*, 1913(1).
<https://doi.org/10.1088/1742-6596/1913/1/012011>

iGEM COMPETITION 2021

The International Genetically Engineered Machine (iGEM) competition is a worldwide synthetic biology competition conducted by the iGEM Foundation in Boston, Massachusetts, USA. The ten-day-long Giant Jamboree event between November 04-14, 2021, brought together 350 participating teams from across the world.

The iGEM 2021 team of IISER Tirupati won a Gold Medal in the iGEM competition for the third consecutive year, making it a hat-trick of gold medals. They won the award for their synthetic biology project on women's health and empowerment, highlighting inclusivity from all sections of society. Their project, "OviCloak: A Novel Contraceptive for Uterus Owners", was also nominated for seven Track awards, the highest number of nominations for any Indian team in the history of iGEM competitions.

The OviCloak is not just a project for competition but a vision to bring about a change in society through concerted efforts. The project aimed to genetically modify the commensal bacteria of the fallopian tubes to produce an ovum-specific contraceptive molecule in a regulated manner. This is a non-hormonal approach to the spectrum of Long-Acting Reversible Contraceptives. The Institute will continue spreading the acquired knowledge to make this society a better place to live in.

The iGEM team of 15 students from the Biology, Physics and Chemistry streams of BS-MS 2018 & 2019 batches were mentored by Dr Raju Mukherjee, Prof G Ambika, and Prof B J Rao.



▲ iGEM 2021 team: Adil Aman, Akshay Tawale, Ankush Kaushik, Ashwin Pillai, Ashwin Sharma, Athira Anil, Fathima Aslaha T R, Komal Pati, Lochan Chaudhari, Niloufer Shanavas, Prameya Garge, Rajeshree Umbarkar, Shivam Kumar, Shreyas Parkhie and Shubhra Singhal.

ACADEMIC ACHIEVEMENTS OF THE STUDENTS

FELLOWSHIPS AND AWARDS

Ms Chiti Arvind and Ms Abhilasha Kapoor, who joined the Biology Department's PhD program in January 2021, were both selected for the prestigious Prime Minister's Research Fellows (PMRF) award last year. Two iPhD students, Mr Jisvin Sam and Mr Sharang Rav Sharma (both in the Physics Department), also received the PMRF award last year.

Mr Akshay U Nair, a PhD scholar from the Biology Department, was selected for the Fullbright-Nehru Doctoral Research Program to work for nine months in a US laboratory.

Two students of BSMS 2017, Ms Deevitha Balasubramanian and Ms Megha Maria Jacob, did their master's thesis abroad via ENS scholarship under the guidance of Dr YadGhavi-Helm and Dr Muriel Grammont, respectively. Ms Purva Atul Naik was selected for the MPI Master's thesis internship.

Two undergraduate students, Ms Prarthana Agrawal (BSMS 2018) and Ms Gopika Sundar (BSMS 2018) received the DAAD WISE fellowship for summer training in Germany. Ms Gopika's research topic for the fellowship is "Design, synthesis and characterization of ATP binding mini proteins", and she is being guided by Dr Franziska Thomas from Heidelberg University. Ms Prarthana received the DAAD fellowship to work with Prof Matthias Vojta at Technische Universität Dresden on Strain engineering in frustrated magnets. However, due to a clash with the funding from her research group and DAAD WISE, she could not pursue her fellowship.

AWARDS IN STUDENT COMPETITIONS

Ms Prarthana Agrawal (BSMS2018) and Mr Sanskar Agrawal (BSMS2019) won Decoherence, a physics competition held at the UG level by IISc Bangalore. The top five teams which entered the final rounds included top teams from MIT Cambridge, NYU USA, IIT-Guwahati, IIT-Madras, and our team from IISER Tirupati. IISER Tirupati ranked first in the finals, followed by MIT Cambridge, USA and New York University, USA.

Mr Sanskar Agrawal, Mr Anhad Bagga, Ms Rajeshree Umbarkar and Mr Nachiketh Sudarshan from BSMS2019 have won two prizes at Mimamsa 2022, organized by IISER Pune. Our team has emerged as the National Runner-ups in Mathematics as well as the Zonal Toppers.

Mr Shreyas Samir Parkhie and Ms Shubhra Singhal received the Seed for Change grant from Mittal Foundation, USA. The team aims to show Spirulina as a potential nutra supplement for Anemia. Their project is titled India EATS (Eradicating Anemia through Spirulina).

In a national biology competition called Biotriathlon held in December 2021, the IISER Tirupati student team won the competition from all over India. Mr Sanskar Agrawal (BSMS2019), Ms Rajeshree Umbarkar (BSMS2019), Ms Nitya Prabhandam (BSMS2018), and Mr Prameya Garge (BSMS2018) were the participants. Mr Sanskar Agrawal, Ms Rajeshree Umbarkar and Ms Nitya Prabhandam won the biology treasure hunt conducted by IISER TVM.

RESEARCH



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NEW FACULTY AND STAFF

PROFESSOR



Prof Ramesh Venkata Sonti
Chair, Biology

ADMINISTRATION STAFF



Mr Ramchandra Shinde
Office Assistant



Mr Nagateja Saride
Laboratory Technician, Chemistry

AWARDS AND HONOURS TO FACULTY

AWARDS

Aravindan Vanchiappan

MRSI Materials Science Annual Prize (2021) by Materials Research Society of India

Balaraman Ekambaram

MRSI Medal (2021) by Materials Research Society of India in recognition of research contributions to the field of Materials Science and Engineering

Ramesh Sonti

Prof N Appaji Rao Best Mentor award instituted by the Indian Institute of Science Alumni Association, Bengaluru

HONOURS

Balaraman Ekambaram

Selected as a part of the DST Coffee Table Book: '75 Under 50: Scientists Shaping Today's India' Published by Vigyan Prasar, Govt. of India. ISBN: 9788174803764

Vijayalakshmi V Subramanian

Wellcome Trust UK/DBT India Alliance Intermediate Fellowship 2022-2026

MEMBERSHIPS, FELLOWSHIPS & AFFILIATIONS OF FACULTY

Ambika G

- Member, Board of Editors, *The European Physical Journal Special Topics (EPJST)*, Springer, EDP Sciences and Italian Physical Society
- Editorial Board Member, *Proceedings of the Royal Society A: Mathematical, Physical and Engineering Sciences*, Royal Society Publishing, London
- Vice President, Society for Nonlinear and Complex Systems (SoNCoS), India
- Chairperson, Subject Expert Committee (SEC) – Physical & Mathematical Sciences, DST Women Scientist Scheme (WOS-A), DST
- Member, Program Advisory Committee, Consolidation of University Research for Innovation and Excellence in Women Universities (CURIE), WISE-KIRAN, DST
- Member, Selection committee- INDO-U.S. Fellowship for Women in STEM (WISTEM)-KIRAN, DST
- Visiting Associate, Inter University Centre for Astronomy and Astrophysics (IUCAA), Pune
- Member, BBS oversight committee, University of Melbourne, Australia
- Member, National Organizing Committee, Conference on Nonlinear Systems and Dynamics (CNSD)
- Member, National Advisory Committee, Complex Dynamical Systems and Applications (CDSA)
- Member, Board of Studies, G. H. Rasoni Institute of Engineering & Technology, Pune

Aniket Chakrabarty

- Associate Editor, *Mineralogical Magazine* (Mineralogical Society), Cambridge University Press
- Life Member, Mineralogical Society of Great Britain and Ireland
- Life Member, Indian Geological Congress (IGC)

Anilatmaja Aryasomayajula

- Member, Ramanujan Mathematical Society

Aravindan Vanchiappan

- Fellow, Institute of Physics (FInstP), IOP, UK
- Fellow, Royal Society of Chemistry (FRSC), RSC, UK
- Life Member, Indian Society for Electroanalytical Chemistry (ISEAC)
- Life Member, Society for Advancement of Electrochemical Science and Technology (SAEST)
- Life Member, Chemical Research Society of India (CRSI)
- Life Member, Materials Research Society of India (MRSI)

Arunima Banerjee

- Visiting Associate, Inter-University Centre for Astronomy & Astrophysics (IUCAA), Pune

- Elected Member of the Editorial Board, *Journal of Astronomy & Astrophysics*, Indian Academy of Sciences
- Elected Member of the Selection Committee, Justice Oak Best Thesis Award, Astronomical Society of India (2021-22)

Ashwani Sharma

- Life Member, International Society of Aptamers (INSOAP)

Balaraman Ekambaram

- Editorial Advisory Board, *Chemistry Open*, Wiley
- Elected Member, Indian National Young Academy of Science (INAYAS), INSA (2018–2022)
- Member, Precious Metals Sectional Committee (MTD 10), Govt. of India
- Affiliate Member, International Union of Pure and Applied Chemistry (IUPAC)
- Fellow, Royal Society of Chemistry (FRSC)
- Elected Member, National Academy of Sciences, India
- Life Member, Chemical Research Society of India (CRSI)
- Life Member, Catalysis Society of India
- Life Member, Material Research Society of India (MRSI)
- Life Member, The Society for Polymer Science, India
- Member, India's Carbon Capture & Utilization Network

Chitrasen Jena

- Council Member, STAR Collaboration, Brookhaven National Laboratory, New York, USA
- Member, Electron-Ion Collider User Group, Brookhaven National Laboratory, New York, USA
- Associate Member, ALICE Collaboration, European Organization for Nuclear Research-CERN, Geneva, Switzerland
- STAR Coordinator for STAR-ALICE-India Collaboration
- Member of the STAR Collaboration Talks Committee

Eswareiah Chakali

- Life Member, Astronomical Society of India (ASI)

Eswarayya Ramireddy

- Guest Associate Editor, Plant Development and EvoDevo section of *Frontiers in Plant Science*
- Elected as a Review Editor, *Frontiers in Physiology* and *Frontiers in Plant Science*

Ganesh K N

- Member, Board of Directors, NCL Venture Center, Pune (2007-till present)
- Member, Board of Directors, Innovasynt Technologies

(I) Ltd, Khopoli, Raigad Dist., Maharashtra (2017-till present)

- President, Indian Society of Nanomedicine (2019-present)
- Member, Research Advisory Council, Symbiosis International University, Pune (June 2021-)
- Member, National Biotech URJIT Cluster Steering Committee (May 2021-)
- Member, Governing Council, SRM University, Amaravati, Andhra Pradesh (2020-)
- Chairman, Governing Council, Center for Nanoscience (CeNS), Bengaluru (2021-)
- Member, Board of Governors, Gujarat Biotechnology University, Gandhinagar (2022-)
- Member, Management Council, and Member Finance Committee, Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR), Bengaluru (2022-)
- Chairman, DST Committee for VAJRA Fellowships (2022-)
- Chairman, DST- FIST Advisory Board (2022-)
- Fellow, Academy of Sciences for Developing World, The World Academy of Sciences (TWAS)
- Fellow, Indian National Science Academy (INSA)
- Fellow, Indian Academy of Sciences (IASc)
- Fellow, National Academy of Sciences, India (NASI)
- Founding Co-Editor, *ACS Omega*, American Chemical Society (ACS)
- Member, Editorial Advisory Board, *Chemical Reviews*, American Chemical Society (ACS)

Gopinath Purushothaman

- Member, American Chemical Society (ACS)
- Life Member, Chemical Research Society of India (CRSI)

Jatish Kumar

- Early Career Advisory Board Member, *ACS Materials Letters*, American Chemical Society (ACS)
- Guest Associate Editor, Special Issue on Supramolecular Chemistry in *Frontiers in Chemistry*
- Review Editor, *Frontiers in Chemistry*
- Member, Chemical Research Society of India (CRSI)
- Member, Materials Research Society of India (MRSI)
- Member, Japan Society for Promotion of Science (JSPS) Alumni, India

Jessy Jose

- Member of the International Astronomical Union (IAU)
- Life member of the Astronomical Society of India (ASI)
- Member of the American Astronomical Society (AAS)
- Member, Scientific Organizing Committee, Annual meeting of Astronomical Society of India (ASI) (2022-2025)
- Member of the Scientific Advisory Committee, India-TMT (Thirty Meter Telescope)
- Visiting Associate, Inter University Centre for Astronomy and Astrophysics (IUCAA), Pune
- Member of the International Science Development Team, Thirty Meter Telescope (TMT)

Lakshmi Lavanya R

- Member, Ramanujan Mathematical Society

Nandini Rajamani

- External Editorial Board Member, *Communications Biology*, Springer Nature (Aug 2020-Aug 2021)
- External Editorial Board Member, *Cheetal Magazine*, Wildlife Preservation Society of India, Dehradun (till Oct 2021)

Nibedita Pal

- Life Member, Fluorescence Society, India

Nirmala Krishnamurthy

- Member, Iota Sigma Pi: USA; The National Honor Society for Women in Chemistry

Pankaj Kumar Koli

- Member of The Society of Biological Inorganic Chemistry (SBIC)
- Humboldt Experienced research awards (2021)
- Member of The Society of Biological Inorganic Chemistry (SBIC)
- DAAD Experienced research awards (2021-2024)

Rajesh Viswanathan

- Editorial Board Member, *Journal of Biosciences*, Indian Academy of Sciences and Springer
- Editorial Board Member, *Current Organocatalysis*, Bentham Science
- Visiting Associate Professor, University of North Florida, Jacksonville, Florida, USA
- Consultant, Gingko Bioworks, Boston, Massachusetts, USA
- Member (# 2309117), American Chemical Society (2002-)
- Member (# 8561585), American Society of Pharmacognosy (2014-), serving on their editorial website committee
- Nominated Faculty member, Alpha Chi Sigma (AXΣ), Cleveland Chapter, Ohio, USA
- Member, International Society for Cyanophyte Research
- CSIR-FIRST: Permanent Reviewer
- Member of Senate, IIT Tirupati

Raju Mukherjee

- Life Member, Proteomics Society of India (2016-)
- Breakthrough Science Society, Kolkata (2019-)

Ramesh Sonti

- Fellow, Indian National Science Academy (INSA)
- Fellow, Indian Academy of Sciences (IASc)
- Fellow, National Academy of Sciences, India (NASI)
- Fellow, National Academy of Agricultural Sciences (NAAS)
- Fellow, Telangana Academy of Sciences (TAS)

- Honorary Member, Plant Tissue Culture Association (India) [PTCA(I)]

Ramkumar Sambasivan

- Member, Indian Society for Developmental Biologists (InSDB)

Ravi Kumar Pujala

- Review Editor, *Frontiers in Soft Matter* (Since 2021)
- Member, Board of Studies for BSc (Blended) program in PVKN college, Chittoor in collaboration with University of Melbourne
- Member, Center for Atomic, Molecular, and Optical Sciences and Technologies (CAMOST) - a joint initiative of IISER Tirupati and IIT Tirupati
- Member, Indian Society of Rheology (ISR)

Robin V V

- Editorial Board Member - Subject Editor (Biology-Ecology and Evolution), *Current Science*, Current Science Association and Indian Academy of Sciences (2016-)
- Associate Editor, *Ecology and Evolution*, Wiley (2018-)
- Associate Editor, *Proceedings of the Royal Society B: Biological Sciences*, Royal Society Publishing, London (2021-)
- Associate Editor, *Journal of Biogeography* (International Biogeography Society), Wiley (2021-)

Saikranthi K

- Elected as a Review Editor, *Frontiers in Climate*

Sambuddha Sanyal

- Member, American Physical Society (APS) (2022-)

Sanjay Kumar

- Life Member, Association of Microbiologists of India

Sivakumar Vallabhapurapu

- Editorial Board Member, *Cancer Cell International*, BioMed Central (BMC) - Springer Nature

Sreenivas Chavali

- Editorial Board, *Amino Acids*, Springer
- Editorial Board, *Journal of Biosciences*, Indian Academy of Sciences, Springer
- Elected Member, Indian National Young Academy of Sciences (INIAS)

Sudipta Dutta

- Member, American Physical Society (APS)

Sunil Kumar S

- Life Member, Indian Society of Atomic and Molecular Physics (ISAMP)

- Associate, Inter-University Centre for Astronomy and Astrophysics (IUCAA), Pune

Swarup Roy Choudhury

- Editorial Board (Plant-abiotic interactions), *BMC Plant Biology*, Springer Nature Group (Mar 2022-)
- Review Editor (Plant Genomics), *Frontiers in Genetics* (2021-)
- Review Editor (Plant Biotechnology), *Frontiers in Plant Science* (2021-)
- Guest Associate Editor (Plant-Abiotic Stress - Special Issue: Drought Stress in Legumes), *Frontiers in Plant Science* (2021-)
- Guest Editor (Special Issue "G Protein-Mediated Signalling in Plants), *International Journal of Molecular Sciences*, MDPI (2021-2022)
- Member, International Scientific Advisory Committee of 'International Symposium on Plant Biotechnology Towards Improving Agri-Food Industry and Healthcare Products' (Oct 2021)

Tapán Chandra Adhyapak

- Member, German Physical Society
- Member, Center for Atomic, Molecular, and Optical Sciences and Technologies (CAMOST) - a joint initiative of IISER Tirupati and IIT Tirupati

Utpal Saikia

- Visiting Research Fellow, University of Southampton, UK

Vasudharani Devanathan

- Member, Indian Academy of Neurosciences (IAN)
- Member, Society for Neuroscience (SfN)

Vijayalakshmi V Subramanian

- Member, Genetics Society of America (GSA)
- Early Career Editor, *Molecular Biology of the Cell (MBoC)*, American Society for Cell Biology (ASCB)

Vijayamohanan K Pillai

- Member, Scientific Advisory Committee (SAC) on Hydrocarbon of the Ministry of Petroleum and Natural Gas (CHT) from 2022-2025
- Member, Research Advisory Council of Gas Authority of India, Ltd. (GAIL)
- Chair of the Project Monitoring Committee (PMC) to assess the progress of their energy-related project supported under the aegis of the Indo-U.S. Joint Clean Energy Research and Development Center (JCERDC) program of IUSSTF (2021-23)
- Chair, Start-up Research Grant (SRG) of Chemistry, SERB, DST, Govt. of India (2021-24)
- Editorial Board Member, *Electrocatalysis*, Elsevier
- Editorial Board Member, *Scientific Reports*, Springer Nature
- Editorial Board Member, *Indian Journal of Chemistry - Section A*, CSIR-National Institute of Science Communication and Policy Research (NIScPR)

EXTRAMURAL RESEARCH PROJECTS

DETAILS OF EXTRA MURAL PROJECTS DURING THE FINANCIAL YEAR 2021-22

Sl. No.	Title of the R&D project	Year in which started	Total Sanction Amount			Status	Project Investigator	Grant received during the year (2021-2022)
			Capital	Recurring	Total			
1	Computational Prebiotic Chemistry: Probing Abiogenesis via Electronic Structure Theory	2016	2476000	1479000	3955000	Completed	Dr Raghunath O Ramabhadran	0
2	DST/Inspire-Dr Anilatmaja	2016	1225000	7075000	8300000	On-going	Dr Anilatmaja Arya Somayajula	0
3	DST/Inspire-Dr Sasmita Mohakud	2015	1225000	7075000	8300000	Completed	Dr Sasmita Mohakud	0
4	Atomic sheet based electronic applications: A theoretical perspective	2016	1868846	1509085	3377931	Completed	Dr Sudipta Dutta	0
5	Surface acoustic wave microfluidics: micro-particle patterning to biosensors	2016	2341420	2033742	4375162	Completed	Dr Dileep Mampallil	0
6	Targeting metastasis-associated protein1 (MTA1) modulated histone modifications in triple negative breast cancer	2016	0	1054395	1054395	Completed	Dr Pakala Suresh Babu	0
7	Automatic analysis of avian acoustics	2017	409093	5404509	5813602	Completed	Dr V V Robin	0
8	Understanding small molecule permeation in Mycobacterium tuberculosis: Towards rational design of drugs with penetrating scaffolds	2017	395100	4252070	4647170	Completed	Dr Raju Mukherjee	0
9	Syntheses and Stabilization of Heterodiatomic(0) compounds of main group elements / Mixed Main Group - Transition - Elements and their Applications in Homogeneous Catalysis	2017	1650000	2662000	4312000	Completed	Dr Sudipta Roy	0
10	Unravelling the role of root cap-specific mannose-binding lectin proteins in root development and their implications in shaping the plant response to environmental cues	2017	900000	4302560	5202560	On-going	Dr Eswarayya Ramireddy	0

Sl. No.	Title of the R&D project	Year in which started	Total Sanction Amount			Status	Project Investigator	Grant received during the year (2021-2022)
			Capital	Recurring	Total			
11	Does sciurid response to human habitat modifications mimic climate change? A study of demographic response on the highest mountains of western Ghats	2017	620397	3614599	4234996	On-going	Dr Nandini Rajamani	0
12	Inspire Faculty Award	2015	1225000	7402422	8627422	Completed	Dr Arunima Banerjee	0
13	Nitric Oxide Dioxygenation Reactions and their Mechanistic Insights	2017	1840000	2634000	4474000	Completed	Dr Pankaj Kumar	0
14	Ramanujan Fellowship	2017	0	8900000	8900000	On-going	Dr Vanchiappan Aravindan	740000
15	DNA/RNA/XNA based smart nanocages for targeted drug delivery	2015	950000	700000	1650000	Completed	Dr Ashwani Sharma	
16	Tuberculosis Diagnostics Based on Mycobacterial Glycolipid-protein interactions	2018	1500000	2991800	4491800	On-going	Dr Raju Mukherjee	849765
17	Inspire Faculty Award	2017	2450000	1050000	3500000	On-going	Dr K Saikranthi	2246000
18	Ramanujan Fellowship	2018	0	3800000	3800000	On-going	Dr Gopinath Purushothaman	760000
19	Nuclease resistant aptamer-nanoparticle conjugate against B7-H3 as targeted therapy and imaging in retinoblastoma	2018	0	3174600	3174600	On-going	Dr Ashwani Sharma	0
20	Theoretical Investigation of Magnetism at Different Length scales	2018	2000000	1812600	3812600	Completed	Dr Sasmita Mohakud	0
21	Towards disbursement of micro grant for implementation of projects under the foldscope scheme	2018	0	800000	800000	Completed	Dr Vasudharani Devanathan	0
22	Investigation of Kruppel-like factor 8 (KLF8) as a Novel Therapeutic Target for Ovarian Cancer	2018	0	8800000	8800000	On-going	Dr Sanjay Kumar	1922000
23	SERB - The Ramanujan Fellowship Award	2018	0	3800000	3800000	On-going	Dr Shibdas Banerjee	760000
24	Maintenance of Repressive Chromatin by NF-kB in the Immune System and Cancer: Towards Novel Physiological Insights and Therapeutic Approachs	2018	3750000	30722240	34472240	On-going	Dr Sivakumar vallabhapurapu	2413280

Sl. No.	Title of the R&D project	Year in which started	Total Sanction Amount			Status	Project Investigator	Grant received during the year (2021-2022)
			Capital	Recurring	Total			
25	Cohomology classes of suspension of generalised projective Stiefel manifold and application	2018	0	1462560	1462560	On-going	Dr Subhash	0
26	Where are geographic barriers to avian gene flow across peninsular India: Testing hypotheses on biogeography, genetic connectivity and evolution	2018	98945	3406474	3505419	On-going	Dr V V Robin	0
27	Development of an electrospray-ionization based ion-trap setup for first measurements of absolute photodetachment cross sections of molecular anions of biological relevance	2018	3516879	1924246	5441125	On-going	Dr Sunil Kumar S	500000
28	A study on questions related to the Fourier transform on the Heisenberg group and to certain function algebras on locally compact groups	2018	95000	1488558	1583558	On-going	Dr Lakshmi Lavanya R	0
29	High throughput screening of inhibitors to de-sequester plasmodium gametocytes from human bone marrow to block transmission of parasites	2018	0	3772560	3772560	On-going	Dr Suchi Goel	250000
30	Life under thermodynamic limit: Insights from methanogenesis in archaea	2018		3185000	3185000	On-going	Dr Mousumi Banerjee	0
31	Maintenance of Pro-Tumorigenic Repressive Chromatin by NF-kB: Towards Novel Therapeutic Approaches and Physiological Insights	2018	626850	3945245	4572095	On-going	Dr Sivakumar Vallabhapurapu	800000
32	National Geographic Society, USA	2018	0	1389487	1389487	Completed	Dr V V Robin	0
33	INDO-US Training Programme "Bioacoustics"	2019	0	850000	850000	On-going	Dr V V Robin	0
34	(WOS-A) Cyclic aromatic hydrocarbons and nanomaterials for biological applications	2017	0	2855000	2855000	Completed	Dr M Betsy	0

Sl. No.	Title of the R&D project	Year in which started	Total Sanction Amount			Status	Project Investigator	Grant received during the year (2021-2022)
			Capital	Recurring	Total			
35	Non-transgenic crop improvement of grain amaranth (A. hypochondriacus) for determinate growth, enhanced seed yield and oil by establishment of TILLING by sequencing platform	2019	0	1337568	1337568	On-going	Dr Eswarayya Ramireddy	1057332
36	Metallaphotoredox Catalyzed Remote (B & Y) C (sp3) -H Trifluoromethylation & Acylation of Carboxamides	2019	0	3043120	3043120	On-going	Dr Gopinath Purushothaman	600000
37	G proteins and prions in regulation of neuritogenesis in diabetes induced neurodegeneration	2019	0	3912832	3912832	On-going	Dr Vasudharani Devanathan	1250000
38	Desorption Electrospray Ionization Mass Spectrometric Imaging for Rapid Molecular Diagnosis of Nephrotic Syndrome	2019	1500000	1800000	3300000	On-going	Dr Shibdas Banerjee	400000
39	Estimates of Bergman Kernels and automorphic forms	2019	0	660000	660000	On-going	Dr Anilatmaja Arya Somayajula	0
40	Multidomain protein dynamics and their functional implications: A single molecule force spectroscopic study	2019	2200000	1892000	4092000	On-going	Dr Soumit Sankar Mandal	300000
41	Removal of Invasive Alien Species and Restoration of Native Grass Land in Kodaikanal Division	2019	0	575000	575000	On-going	Dr V V Robin	0
42	DST/Inspire	2019	0	1340972	1340972	On-going	Dr Ravikumar Pujala	0
43	DST/Inspire	2019	0	2100000	2100000	On-going	Dr Shalini Bhattacharya	0
44	WOSA- B Trash to treasure- the transformation of waste into high performance electrodes for charge storage devices towards zero-emission transportation	2019	700000	2132720	2832720	On-going	Dr Divya M L	0
45	Heterocyclic compounds through borrowings hydrogen catalysis	2019	400000	4073830	4473830	On-going	Dr E Balaraman	1250000

Sl. No.	Title of the R&D project	Year in which started	Total Sanction Amount			Status	Project Investigator	Grant received during the year (2021-2022)
			Capital	Recurring	Total			
46	Janus PNAs as innovative programmable and functional supermolecules for multifaceted chemical biology application	2017	5200000	3160000	8360000	On-going	Prof K N Ganesh	0
47	Explore the functional role of heterotrimeric G-protein signalling in desiccation tolerant lower group of the land plant	2019	664950	1336000	2000950	On-going	Dr Swarup Roy Choudhury	550000
48	Identification and functional characterization of combined drought and heat stress responsive transcription factors in Arabidopsis thaliana	2019	1115000	1629500	2744500	On-going	Dr Annapurna Devi Allu	400000
49	Role of polyampholyte and Polyelctrolyte Polypetide segments in modulating protien expression homeostasis and functionality of intrinsically disordered protiens	2019	1617500	1685250	3302750	On-going	Dr Sreenivas Chavali	400000
50	DNA Interations to provide mechanism insights into the kinetics of DNA bending using and single molecule spectroscopy	2019	2500000	1993000	4493000	On-going	Dr Soumit Sankar Mandal	650000
51	Low mass star formation in diverse environmental conditions	2019	380000	1130872	1510872	completed	Dr Jessy Jose	200000
52	Investigation of Soil Moisture, energy balance and clouud interactions in a changing climates scenario	2019	3000000	1979120	4979120	On-going	Dr K Saikranthi	500000
53	Synthetic control on reduction of dimensionality in lead halide perovskites for efficient broad-band emission	2019	2000000	3023830	5023830	On-going	Dr Janardhan Kundu	0
54	The Role of mitochondrial dynamics in mitochondrial dysfunction during the progression of Cancer	2019	945400	4678120	5623520	On-going	Dr Sanjay Kumar	1100000
55	Chiral Luminescent material as security tags for anti-counterfeiting	2020	3000000	1741000	4741000	On-going	Dr Jatish Kumar	500000
56	Genetic Program governing vertebrate head mesoderm specification	2016	823800	6760000	7583800	Completed (2019-20)	Dr Ramkumar Sambasivan	0

Sl. No.	Title of the R&D project	Year in which started	Total Sanction Amount			Status	Project Investigator	Grant received during the year (2021-2022)
			Capital	Recurring	Total			
57	DBT- Ramalingaswami Re-entry Fellowship	2019	0	9610000	9610000	On-going	Dr Sreenivasa Chavali	1044055
58	DBT- Deciphering the chickpea	2019	0	4250000	4250000	On-going	Dr Swarup Roy Choudhury	780414
59	Rufford Foundation, UK	2019	0	56100000	56100000	On-going	Dr V V Robin	0
60	The Dhuleep Matthai Nature Conservation Trust (DMNCT)- Conservation action with Forest Departments on Montane Shola Habitats	2019	0	1500000	1500000	On-going	Dr V V Robin	100000
61	Wildlife Conservation Trust (WCT)- Small grants for conservation of Endangered Species and their habitat (WCT-SG)	2019	0	500000	500000	Completed	Dr V V Robin	0
62	Developing cellular models for GNE Myopathy	2019	0	400000	400000	On-going	Dr Ramkumar Sambasivan	400000
63	Scheme on R & D for Conservation & Development (MoEF)	2019	495000	7318491	7813491	On-going	Dr V V Robin	2357040
64	WOS-B - Molecular mechanism mediating diabetic retinal neurodegeneration role of cell adhesion molecules	2019	0	2934000	2934000	On-going	Dr Harshini Chakravarthy	900000
65	Evolution 2019-Providence Rhode Island USA	2019	0	107408	107408	On-going	Dr V V Robin	0
66	Indo-US- Light induced energy tech	2019	0	400000	400000	On-going	Prof Vijayamohanan K Pillai	0
67	30520076-India Bioscience- Dr Robin	2020	0	70000	70000	On-going	Dr V V Robin	0
68	30120077- DST Swarna Jayanti Dr E Balaraman	2020	0	2500000	2500000	On-going	Dr E Balaraman	500000
69	30120078- DST Swarna Jayanti Dr V Aravindan	2020	0	2500000	2500000	On-going	Dr V Aravindan	500000
70	30120082- Inspire Faculty Award - Dr Debasish	2020	0	2200000	2200000	On-going	Dr Debashish Koner	2224000
71	30120096- Inspire Faculty Award- Dr Hussain	2021	0	2200000	2200000	On-going	Dr Hussain Bhukya	0

Sl. No.	Title of the R&D project	Year in which started	Total Sanction Amount			Status	Project Investigator	Grant received during the year (2021-2022)
			Capital	Recurring	Total			
72	30220075- Development of a Portal Optical- Dr Vasudha	2020	222957	1787421	2010378	On-going	Dr Vasudharani Devanathan	0
73	30220079- Building next generating Lion Dr V Aravind	2020	2800000	500000	3300000	On-going	Dr V Aravindan	150000
74	30220080- Bulding Better Batteries- Dr Aravindan	2020	2500000	250000	2750000	On-going	Dr V Aravindan	450000
75	30220081-Non Innocent Ligands- Dr E Balaraman	2020	2150000	5345752	7495752	On-going	Dr E Balaraman	500000
76	30220083-Investigations on Quantum matte- Dr Sambudda	2020	1996753	452675	2449428	On-going	Dr Sambuddha Sanyal	0
77	30220084- Light Induced spin- crossover - Dr Padmabati M	2020	1500000	380000	1880000	On-going	Dr Padmabati M	90000
78	30220086- Biomimetic Total Synthesis-Dr Rajesh V & Dr Suchi Goel	2020	2088700	4297702	6386402	On-going	Dr Rajesh V & Dr Suchi Goel	800000
79	30220087- Development of Asymmetric Michael- Dr Kiran Kumar P	2020	682999	1817000	2499999	On-going	Dr Kiran Kumar P	0
80	30220088- In Silico inverse design- Dr Rakesh	2020	2250000	510000	2760000	On-going	Dr Rakesh Singh	120000
81	30220089- Investigating the role fo tumor suppression protein- Dr Nibedita	2020	1500000	1343500	2843500	On-going	Dr Nibedita Pal	250000
82	30220095- SERB- Dr Ravikumar P	2021	3500000	1362000	4862000	On-going	Dr Ravi Kumar Pujala	170000
83	30220097- Microfluidic Confinement of Bacteria- Dr Dileep	2021	2992500	2620250	5612750	On-going	Dr Dileep Mampali	0
84	30320092-Energy conservation through electron-Dr Mousumi	2021	0	1140000	1140000	On-going	Dr Mousumi Ghosh	0
85	30320094- Ramalingaswami Reentry RCB- Dr V S Vijayalakshmi	2020	0	1050000	1050000	On-going	Dr V S Vijayalakshmi	0
86	30420069- Ligand Confinement driven- Dr Arun Kumar	2019	0	1093335	1093335	On-going	Dr Arun Kumar Bar	0
87	30520070-Improved root nodule formation- Dr Swarup Roy	2019	1050000	3945000	4995000	On-going	Dr Swarup Roy	365000

Sl. No.	Title of the R&D project	Year in which started	Total Sanction Amount			Status	Project Investigator	Grant received during the year (2021-2022)
			Capital	Recurring	Total			
88	30520071-Chemical tuning of crystal field- Dr Arun Kumar	2019	750000	4058000	4808000	On-going	Dr Arun Kumar Bar	450000
89	30520072-National Conservation foundation- LTEO-Dr Robin	2020	457000	3181932	3638932	On-going	Dr V V Robin	239107
90	30520073-Biodiversity Assessment -Dr Nandini	2020	0	700000	700000	On-going	Dr Nandini Rajamani	560000
91	30520074-Synthesis and evaluation of PNA- Prof Ganesh	2020	0	1111763	1111763	On-going	Prof K N Ganesh	0
93	30520090-CSIR - Dr E Balaraman	2020	0	1100333	1100333	On-going	Dr E Balaraman	0
94	30520091- Testing anthropause-Dr Robin	2021	0	1451850	1451850	On-going	Dr V V Robin	0
95	30520093- GAIL- Dr Balaraman	2021	0	3540000	3540000	On-going	Dr E Balaraman	1500000
96	30520098-Tirupati Biodiversity atlas- Mr Rajasekhar	2021	0	1421420	1421420	On-going	Mr Raja Sekhar Bandi	0
97	30321099- Early mesoderm Patterning- Dr Ramkumar S	2021	876750	7209400	8086150	On-going	Dr Ramkumar S	2710550
99	30221101- Ramanujan Fellowship- Dr Eswaiah Chakali	2021	0	11900000	11900000	On-going	Dr Eswaiah Chakali	2110000
100	30121102- Inspire Faculty Award- Dr Annwasha Dutta	2021	0	2200000	2200000	On-going	Dr Annwasha Dutta	2200000
101	30421104- Fmoc PNA- Alnylam US Inc- Prof K N Ganesh	2021	0	323399	323399	On-going	Prof K N Ganesh	326497
102	30221105- Mechanisic Insights of Nitrite Red (NIR)- Dr Pankaj Kumar	2021	2000000	3926096	5926096	On-going	Dr Pankaj Kumar	3348700
103	30121106- Nanostuctured Materials - Dr Aravindan & Dr Gopi	2021	21700000	9728640	31428640	On-going	Dr V Aravindan	150000
104	30322109- Ordering of magnetic anisotropy- Dr Arun Kumar Bar	2021	3500000	3668832	7168832	On-going	Dr Arun Kumar Bar	4729610
105	30322110- DBT Wellcome - Dr Viji Subramanian	2021	11099429	24540571	35640000	On-going	Dr Viji Subramanian	7276218

Sl. No.	Title of the R&D project	Year in which started	Total Sanction Amount			Status	Project Investigator	Grant received during the year (2021-2022)
			Capital	Recurring	Total			
106	30222111- Investigate the choice - Dr Viji Subramanian		1000000	4071000	5071000	On-going	Dr Viji Subramanian	2363600
107	30322113- Deciphering miRNAs- Dr Suchi Goel	2021	0	3300000	3300000	On-going	Dr Suchi Goel	1100000
108	30222115- Hydrodynamic simulation- Dr Tapan & Dr Ravikumar P	2021	2898337	1125833	4024170	On-going	Dr Tapan Adhyapak & Dr Ravikumar Pujala	3280337
109	30222116- Theoretical and computational exploration- Dr Sudipta Dutta	2021	995430	1874943	2870373	On-going	Dr Sudipta Dutta	1620500
110	30222117- Coordination clipping strategy- Dr Arun Kumar Bar	2021	1499764	3413808	4913572	On-going	Dr Arun Kumar Bar	2960000
111	30222118- Developing molecular probes- Dr Pankaj Kumar	2021	0	2823832	2823832	On-going	Dr Pankaj Kumar	997300
112	30222119- Towards Development of Fluorophores- Dr Sunil Kumar S	2021	2090000	3082244	5172244	On-going	Dr Sunil Kumar S	3128000
113	30222120- Establishing a Regional Biosafety lab (BSL-3) - Dr Raju Mukherjee	2021	80000000	15994880	95994880	On-going	Dr Raju Mukherjee	80400000
114	30122114 - Recycling of Graphite from spent lithium(WMT)- Dr Aravindan	2021	6500000	3344280	9844280	On-going	Dr V Aravindan	7614760
115	30122121- Indian Participation in the ALICE - Dr Chitrasen Jena	2021	2000000	10800000	12800000	On-going	Dr Chitrasen Jena	600000
116	30422122- President Fellows of Harvard College- Dr Vasudharani	2021	0	755365	755365	On-going	Dr Vasudharani Devanathan	755365
117	DBT R.A.P in Biotechnology & Life Science	2019	0	2025600	2025600	On-going	Dr Sarvagalla Sailu	330010.00
118	Cornel University Fellowship- Isha - Dr Robin V V	2021	0	444015	444015	On-going	Dr Robin V V	444015.00
119	J C Bose Fellowship	2019	0	13600000	13600000	On-going	Prof B J Rao	0
120	National Post-Doctoral Fellowship (NPDF) - Dr Brawin Kumar, PDRF	2019	0	2025600	2025600	On-going	Dr Brawin Kumar	0.00
121	National Post-Doctoral Fellowship (NPDF)	2019	0	2025600	2025600	On-going	Dr Melad Shaikh	870000

Sl. No.	Title of the R&D project	Year in which started	Total Sanction Amount			Status	Project Investigator	Grant received during the year (2021-2022)
			Capital	Recurring	Total			
122	National Post-Doctoral Fellowship (NPDF) – Mallikarjuna Nimgampalli	2019	0	1725600	1725600	On-going	Dr Gopalakrishna Murty	1012800
123	National Post-Doctoral Fellowship (NPDF) – Dintomonjoy	2020	0	6808333	6808333	On-going	Prof. Vijayamohan Pillai	1012800
124	DBT R.A.P in Biotechnology & Life Science- Dr K Rajasekhar	2020	0	329560	329560	On-going	Dr K Rajasekhar	0
125	J C BOSE- SERB Prof Vijayamohan Pillai	2020	0	6808333	6808333	On-going	Prof Vijayamohan Pillai	0
126	30521103- J C Bose - Prof Ramesh Sonti	2021	0	1105285	1105285	On-going	Prof Ramesh Sonti	1105285
127	National Post-Doctoral Fellowship (NPDF) – Gopalakrishna Murty, PDRF	2021	0	1920000	1920000	On-going	Dr Gopalakrishna Murty	356400
128	National Fellowship & Scholarship for ST Children	2021	0	8350	8350	On-going		8350
129	National Post-Doctoral Fellowship (NPDF) – Rajasekhar	2021	0	1725600	1725600	On-going	Dr K Rajasekhar	0
130	National Post-Doctoral Fellowship (NPDF) – Sulekha	2021	0	1725600	1725600	On-going	Dr Sulekha	0
131	Prime Minister research Fellowship (PMRF)	2021	0	7966774	7966774	On-going	Prof Vijayamohan Pillai	7966774
132	30422112- Marine Mammal Commission USA- Ms Isha B	2021	0	1803420	1803420	On-going	Dr V V Robin	1803420
TOTAL			220305799	495388826	716799910			177429284

COLLABORATIONS



INTERNATIONAL COLLABORATIONS

- *University of Melbourne, Australia*
- *Temple University of the Commonwealth System of Higher Education, USA*
- *Max Planck Society, Germany*
- *ENS, France*
- *EPFL Lausanne, Switzerland*

NATIONAL COLLABORATIONS

- *Kanpur*
IIT, Kanpur
- *Tirupati*
SVIMS, Tirupati
IIT, Tirupati
National Atmospheric Research Laboratory, Tirupati
Acharya NG Ranga Agricultural University, Tirupati
Sri Padmavati Mahila Visvavidyalayam, Tirupati
Sri Venkateshwara University, Tirupati
Andhra Pradesh Police Department

ENGAGEMENT WITH INDUSTRY

IISER Tirupati engages with industrial organisations in several ways across different departments. Several industries send samples to IISER Tirupati for chemical and biological analysis on a chargeable basis through the I-STEM (Indian Science, Technology and Engineering facilities Map) network. Some specific projects carried out in the past year are listed below.

Alnylam Pharmaceuticals

Alnylam Pharmaceuticals, Inc., Boston, USA is a biopharmaceutical company focusing on the discovery, development and commercialization of RNA interference therapeutics for genetically defined diseases. This project with IISER Tirupati involves design and synthesis of PNA conjugated with multiple GalNAc ligands for testing antisense biological activity. The project is led by Prof KN Ganesh.

GAIL (India) Limited

GAIL (India) Limited is a government-owned natural gas explorer and producer responsible for natural gas processing and distribution in India. Dr Ekambaram Balaraman's translational research with GAIL (India) Limited involves the direct conversion of CO₂ to polycarbonate (diol). This industrial project involves catalyst and process development.

Tata Steel Limited

Tata Steel is among the top steel-producing companies in the world. Dr Ekambaram Balaraman's industrial collaboration with Tata Steel Ltd involves the development of a robust catalytic system for producing carbonaceous material from carbon dioxide without an external hydrogen source. This industrial project involves catalyst and process development.

APMDC Mangampet Barytes Mine

The Andhra Pradesh Mineral Development Corporation Ltd is an undertaking of the Government of Andhra Pradesh for the development of mineral resources and promotion of mineral-based industries in Andhra Pradesh. IISER Tirupati conducts ecological surveys and education programs at the Andhra Pradesh Mineral Development Corporation Barytes Mine at Mangampet. Dr Nandini Rajamani leads the project, now in its second year.

SCIENTIFIC ACTIVITIES OF FACULTY

RESEARCH PUBLICATIONS

Journal Articles

Allu, Annapurna Devi

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- Divya, M. L., Natarajan, S., & Aravindan, V. (2022). Graphene from spent lithium-ion batteries. *Batteries & Supercaps*, 5(6). <https://doi.org/10.1002/batt.202200046>
- Chandrasekaran, S., Li, N., Zhuang, Y., ... Aravindan, V., et al. (2022). Interface charge density modulation of a lamellar-like spatially separated Ni_9S_8 nanosheet/ Nb_2O_5 nanobelt heterostructure catalyst coupled with nitrogen and metal (M = Co, Fe, or Cu) atoms to accelerate acidic and alkaline hydrogen evolution reactions. *Chemical Engineering Journal*, 431. <https://doi.org/10.1016/j.cej.2021.134073>
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Jena, Chitrasen

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Book Chapters

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INVITED LECTURES/TALKS/SEMINARS

Ambika G

- *Frequency chimera states in coupled systems* - 13th Conference on Nonlinear Systems and Dynamics, CNSD2021, SASTRA University, Thanjavur (Dec 17-22, 2021)
- *Complexity Measures from Data*, RUSA Lecture Series in Nonlinear Dynamics, Bharathidasan University, Tiruchirappalli (Jan 11, 2022)
- *Women in STEM*, Sree Rama Engineering College, Tirupati (Mar 08, 2022)

Anilatmaja Aryasomayajula

- *Sub-convexity estimates of Hecke eigencusp forms*, IISER-NISER Mathematics Meet, IISER Tirupati (May 2021)

Annapurna Devi Allu

- “*Science Innovation and activities of IISER Tirupati*” at the DST meeting on Vignana Mahostava as part of the Azadi Ka Amrit Mahotsava hosted by Andhra Pradesh (Sep 2021)
- “*Regulatory circuitries of H2O2-responsive NAC transcription factor, JUNGBRUNNEN1*” at the International Symposium on Plant Developmental Plasticity: A Molecular Perspective (PDPAMP), Acharya Nagarjuna University, Guntur and IISER Tirupati (Sep 2021)
- “*Deciphering the molecular circuitry underlying plant stress responses*” as part of the National Faculty Development Program on Genome Engineering & Technology, conducted by Central University of Kerala, Kasaragod, together with AICTE Training & Learning (ATAL) Academics (Jan 2022)
- Refresher Course in Life Sciences, UGC-HRDC, Sri Venkateswara University, Tirupati (Mar 2022)
- Delivered six lectures as part of the Science Academy Refresher Course in Organization, Complexity and Evolution of Living Systems, conducted by the Dept. of Biotechnology, Govt. Degree College (Men), Srikakulam, Andhra Pradesh (Mar 2022)

Aravindan Vanchiappan

- *Graphite from Spent Li-ion Batteries for Metal-ion Capacitors* - Li-ION 2021: The International Virtual Conference on Recent Advances in Li-ion Batteries (LIBs) and their Recycling Methods for Sustainable Development, jointly organized by IIT Hyderabad and The Open University, UK (Dec 01-03, 2021)
- *High Energy Li-ion Capacitors: An approach beyond Intercalation* - 7th International Conference on Advanced Nanomaterials and Technology held at IIT Guwahati (Dec 14-17, 2021)
- *MRSI Medal Lecture - Recycling Spent Li-ion Batteries* - MRSI Materials Science Annual Prize Lecture held virtually at IIT Madras, Chennai (Dec 20-24, 2021)
- *Research Progress on Li-ion Capacitors* in the International Conference on Energy Materials and Devices (ICEMD-2022) held at Banaras Hindu University (BHU), Varanasi (Jan 11-12, 2022)
- International Conference on Li-ion Battery Recycling Novel Materials and Technologies for Energy and Environment Applications (NMTE2A-2022) held at BITS Pilani, Hyderabad Campus (Feb 18-19, 2022)

Arun Kumar Bar

- *Molecular Magnetism - Origin and Prospects*, Contai PK College, Vidyasagar University, West Bengal (Sep 25, 2021)

- *Tailoring Molecular Magnetism in Lanthanide-Based Mononuclear Complexes via Concomitant Crystal-Field and Chemical Tuning*, Ashoka University, National Capital Region (NCR), Sonapat, Haryana (Mar 15, 2022)

Arunima Banerjee

- *Towards a dynamical model of an interacting pair of galaxies using machine learning* - Department of Physics, Indian Institute of Science, Bengaluru (May 2021)

Ashwani Sharma

- *Advancements in In vitro Diagnostic Methods in Healthcare*, Accelerate Vigyan "Karyashala" at MNNIT-Allahabad, Prayagraj, UP (Jul 20, 2021)

Balaraman Ekambaram

- *Conversion of CO₂ to Carbanious Material without External Hydrogen*, Research Council Meeting, Tata Steel Limited. (Jun 11, 2021)
- *Green Chemical Synthesis for Sustainable Society*, Recent Trends & Future Prospects of Nano- & Bio-Catalysis in Green Chemistry, Government Arts and Science College, Hosur (Aug 19, 2021)
- *(De)hydrogenative Catalysis for Sustainable Chemistry*, CRSI Trichy - Madurai Local Chapter, e-lecture workshop on Advances in Chemical Sciences, Cauvery College for Women (Autonomous), Trichy (Sep 11, 2021)
- *Visible Light Photo(redox) Catalysis for Sustainable Chemical Synthesis and Hydrogen Production*, APA-Prize for Young Scientists lecture, 11th Asian Photochemistry Conference, APC 2021-Virtual (Nov 01-04, 2021)
- *Smart Catalysis for Sustainable Chemistry*, UGC-Human Resource Development Centre, Madurai Kamaraj University, Madurai (Nov 20, 2021)
- *The Power of Organometallic Catalysis*, Refresher Course in Chemistry, UGC-HRDC, Bharathiar University, Coimbatore (Nov 21, 2021)
- *Ru-Catalysed Expedient Hydrogenation/Deuteration Reactions Generality* - National Organic Symposium Trust (NOST) - Organic Chemistry Conference (OCC) 2021, Chennai (Nov 25-28, 2021)
- *Magnetic Resonance Made Easy*, Department of Chemistry, Madurai Kamaraj University, Madurai (Dec 03, 2021)
- *MRSI Medal Lecture - N-Graphitic Modified Metal-Nanoparticles Supported on Graphene for Dehydrogenation and Related Reactions*, MRSI-AGM Conclave 2021, Chennai (Dec 20-23, 2021)
- *Smart Catalysis: Green Chemical Synthesis*, Srinivasa Ramanujan Institute for Basic Sciences (SRIBS), Catalysis Webinar, Mahatma Gandhi University, Kottayam, Kerala (Jan 14, 2022)
- *CO₂ to Value-Added Products: Challenges and Opportunities*, Online Faculty Development Programme on Carbon Captured & Storage: A multidisciplinary approach, Central University of Tamil Nadu (CUTN), Thiruvavur (Feb 21-25, 2022)

Chitrasen Jena

- *"STAR Run21 Summary and Trigger Board/QA Status"* at the STAR Collaboration Meeting (online) at Rutgers University, New Jersey, USA (Sep 13-24, 2021)

Eswareiah Chakali

- *"Multi-wavelength polarimetric technique and interplay among magnetic field, turbulence, gravity, and stellar feedback"* at IISER Tirupati (Jul 29, 2021)
- *"Multi-wavelength polarimetric technique: interplay among magnetic field, turbulence, gravity, and stellar feedback"* at 7th Regional Astronomical Meeting (RAM) (Sep 08-10, 2021)
- *"Multi-wavelength polarimetry to investigate the interplay among magnetic field, turbulence, gravity, and stellar feedback"* at the Department of Physics, Indian Institute of Science (IISc), Bengaluru (Oct 20, 2021)
- *"Multi-wavelength polarimetry to investigate the interplay among magnetic field, turbulence, gravity, and stellar feedback"* at Aryabhata Research Institute of Observational Sciences (ARIES), Nainital, Uttarakhand (Nov 30, 2021)
- *"Multi-wavelength polarimetry to investigate the interplay among the magnetic field, turbulence, gravity, and stellar feedback"* at Indian Institute of Astrophysics (IIA), Bengaluru (Dec 10, 2021)

Eswarayya Ramireddy

- *"Plant developmental Plasticity: A molecular perceptive"*, International Webinar jointly organised by Acharya Nagarjuna University, Guntur and IISER Tirupati (Sep 27, 2021)
- Refresher Course in Life Sciences, UGC-HRDC, Sri Venkateswara University, Tirupati (Oct 28, 2021)
- Workshop on "Stakeholder Consultative Workshop on Research Internship at UG/PG Program Level" Organized by Yogi Vemana University, Kadapa (Mar 02, 2022)
- IASc-Bengaluru Sponsored RC entitled: "Organization, Complexity and Evolution of Living Systems" held at Government Degree College (Men), Srikakulam, Andhra Pradesh (Mar 26-27, 2022)

Ganesh K N

- *On-line teaching and learning: Challenges, Chemistry on Digital Education*, NIT Warangal (Jul 29, 2021)
- *New Vistas in Chemistry*, IIT Tirupati (Aug 16, 2021)
- *Life of a PhD student*, IISER Tirupati (Aug 17, 2021)
- *PNAs with Double Face: Bimodal PNAs as Templates for Supramolecular Assemblies of Nucleic Acids*, International Symposium on Nucleosides, Nucleotides and Nucleic Acids (IS3NA) (Sep 2021)
- *What is science and why we do science? Characteristics of a good scientist*, Indrashil University, Rajpur, Gujarat (Oct 07, 2021)
- *Structural control of Peptide Nucleic Acid (PNA) Rotamers:*

Serendipitous Fluorescence in α , β and γ -gem-dimethyl PNA monomers and DNA/RNA Hybridization Selectivity of PNA Oligomers. 58th Annual Convention of Chemists (ACC), Indian Chemical Society (ICS) (Dec 23, 2021)

- *Peptide Nucleic Acids (PNA) with double face: Novel scaffolds for constructing multistranded DNA assemblies*, Symposium in Physical Chemistry Physical Biology PCPB- 2021 (Oct 25, 2021)
- *Spine surgery of Peptide Nucleic Acids (bm-PNA): Upgrading PNAs for multi stranded assemblies*, Panjab University, Chandigarh (Feb 23, 2022)
- *Ten great ideas in the history of Science*, Science Day, IIT Tirupati (Feb 28, 2022)
- *Spine surgery of Peptide Nucleic Acids (bm-PNA): Upgrading PNAs for multi stranded assemblies*, International Symposium on "Proteins and Biology" Maharaja Sayajirao University, Vadodara (Mar 01, 2022)
- *Ethics in Science*, IISER Tirupati (Mar 19, 2022)

Gopinath Purushothaman

- *"Functionalization of aryl ureas using photoredox catalysis"* - 4th National Conference in Chemistry, Dept. of Chemistry, IIT Gandhinagar (Aug 06-07, 2021)
- *"Visible Light Photoredox Catalysis: A New Tool for Organic Transformations"* - E-workshop on Visible Light Organic Transformations, Post Graduate Centre, Jyoti Nivas College, Bengaluru (Oct 23, 2021)
- *"Asymmetric Organocatalysis: A powerful tool in Contemporary Organic Synthesis"* - Nobel Evening 2021, IISER Tirupati (Oct 30, 2021)

Gururaja H A

- NASI-TMC workshop on Differential Geometry (Delivered 6 Lectures) held at Central University of Punjab, Bathinda. (Jul 05-24, 2021)
- *"On Geodesic Conjugacy Rigidity of Flat Cylinder"* in In-House Symposium at IISER Bhopal (Mar 26, 2022)

Jatish Kumar

- *Raman Effect: From Discovery to Recent Advances*, International Webinar Series on Advanced Functional Materials organized by Zamorin's Guruvayurappan College (ZGC), Kozhikode, Kerala (Jun 11, 2021)
- Moon Day inaugural lecture (online), Moon Day Celebration at Government Vocational Higher Secondary School (GVHSS), Atholi, Kozhikode (Jul 21, 2022)
- *An Introduction to the World of Nanoscience and Nanotechnology*, National Webinar organised by the Department of Chemistry, Sree Vidhyadhi Raja NSS College, Vazhoor, Kerala (Jul 29, 2021)
- Delivered a series of lectures on the topic *"Chemical Kinetics"* in the "National Level Student Enrichment Programme for Strengthening the Chemistry Fundamentals," organized by the Department of Chemistry, St. Joseph's College (Autonomous), Devagiri, Kozhikode (Sep 30 & Oct 01, 2021)

- *"Fascinating World of Nanoscience and Nanotechnology"* - Chemistry Association Inauguration and National Seminar at Mannaniya College of Arts and Science, Pangode, Thiruvananthapuram (Dec 16, 2021)
- *Recent Advances in Raman Spectroscopy*, Workshop on Molecular Spectroscopy 2022 (WMS-2022) organized by the Department of Chemistry, Calicut University, Malappuram, Kerala (Mar 14-15, 2022)

Jessy Jose

- *Exploring our coolest and youngest neighbors: brown-dwarfs and free-floating planetary-mass objects*, Regional Astronomy Meeting sponsored by Inter-University Centre for Astronomy and Astrophysics (IUCAA), Pune (Sep 08-09, 2021)
- *Our coolest and youngest neighbors: What do we know about them?* - Aryabhatta Research Institute of Observational Sciences (ARIES), Nainital, Uttarakhand (Sep 14, 2021)
- *Protoplanetary Disks: Formation, Characteristics and Evolution, Recent Advancements in Astrophysics*, Calicut University, Malappuram, Kerala (Feb 18-19, 2022)

Kanagasekaran T

- Collaborative Conference on Materials Research (CCMR), Seoul, South Korea (Jul 03-07, 2021)
- International Joint Graduate Program in Materials Science, Tohoku University, Sendai, Miyagi, Japan (Dec 09-11, 2021)

Lakshmi Lavanya R

- Panelist, Celebrating Women in Mathematics (hosted online) by IISER Berhampur (May 12, 2021)
- Mathematics Training and Talent Search (MTTS) Programme - Online (May 29 - Jun 15, 2021)
- Delivered four lectures in the IWM Winter School for Young Women in Mathematics (hosted online), jointly organised by IWM and IIT Kanpur (Dec 15-24, 2021)

Nagaraj D S

- Three lectures on Algebra, Academy Work-shop on Algebra (Sep 07-09, 2021)
- *"What is Algebraic Geometry"* at Meeting of e-short term training program" at SRM Institute of Technology Chennai (Dec 18, 2021)

Nandini Rajamani

- Panelist in TED Circles TEDxPESU event: Appreciating Earth (Apr 19, 2021)
- Shomita Mukherjee and Nandini Rajamani. *Role of small/medium-sized carnivores in tropical ecosystems*. Expert talk at Azadi ka Amrit Mahotsav: 75 years of India's Independence. Central Zoo Authority, Ministry of Environment, Forest & Climate Change, GoI (Jun 18, 2021)

- Nandini Rajamani and Smrithi Haricharan. *How to read a scientific paper*. Invited lecture at Cotton University, Guwahati (Jun 22, 2021)
- *Understanding evolution with animals in your garden: The case of the commensal palm squirrels*. Refresher course in Environmental Studies, UGC-HRDC, Sri Venkateswara University, Tirupati (Oct 30, 2021)

Nibedita Pal

- “Single molecule fluorescence microscopy: Investigating biomolecular mechanism, one molecule at a time” at Department of Physics, IISER Bhopal (Aug 18, 2021)

Nirmala Krishnamurthy

- *Science Communication and Popularization: A Glimpse into the initiatives of IISER Tirupati*, Online, Organized by Department of Science and Technology, Govt. of India and Andhra Pradesh State Council of Science and Technology (APCOST), Govt. of Andhra Pradesh (Feb 23, 2022)
- *Research Ethics and Scientific Integrity*, Ethics Session for IISER Tirupati Students, Online (Mar 19, 2022)

Padmabati Mondal

- Theoretical Chemistry Symposium 2021, Organized by IISER Kolkata, S. N. Bose National Centre for Basic Sciences, Kolkata and University of Kalyani, West Bengal (Dec 11-14, 2021)

Pankaj Kumar Koli

- Invited lecture on Nitric Oxide and Biology at Ruhr-Universität Bochum, Germany
- Invited lecture on Biomimetic models in nitrite reductase at University of Greifswald, Germany

Raghunath O. Ramabhadran

- DBT Sponsored Science Adda on Chemistry where there is Almost Nothing: The Possible Origins of Life
- pK-Yay – A Completely Black-Box & User-Friendly Method for Accurate Computation of Aqueous pKa Values of Strong and Weak Acids, Theoretical Chemistry Symposium, IISER Kolkata

Rajesh Viswanathan

- *Biocatalytic Strategies for Total Synthesis of Medicinal Natural Products*, Dept. of Chemistry, Sri Venkateswara University, Tirupati (Dec 2021)
- *Biocatalytic Strategies for Total Synthesis of Medicinal Natural Products*, National Chemical Laboratory, Pune
- *Genome-Enabled Molecular Synthesis Unraveling New Pathways and Inhibitors*, Online seminar at University of Puerto Rico
- “Metabolic Diversity of Group V Cyanobacteria and Marine Actinomycete Unraveled through Pathway Studies”, American Society for Microbiology Meeting, Florida

Ramesh Sonti

- “*Biotechnology in Crop Improvement*” on the occasion of National Technology Day at CSIR-Central Institute of Medicinal and Aromatic Plants (CIMAP), Lucknow (May 11, 2021)
- “*My experiences of mentoring individuals and institutions*” on the occasion of award of Prof. N. Appaji Rao Best Mentor award by the Indian Institute of Science Alumni Association, Bengaluru (Jul 12, 2021)
- “*How do Plants ward off pathogens?*” - Foundation day Lecture of IISER Mohali (Sep 27, 2021)
- “*Modulation of host innate immunity by bacterial effectors in the rice-Xanthomonas interaction*” in the online symposium on “Plant Developmental plasticity: a molecular perspective” organized at Acharya Nagarjuna University, Guntur and IISER Tirupati (Sep 29, 2021)
- “*How do plants ward off pathogens?*” in Tezpur University, Assam (Jan 24, 2022)
- “*Multiple roles of a bacterial effector in promoting virulence on rice*” in Newton Bhabha Fund Researcher Link Workshop on Sustaining Food Production under environmental stress organized by National Agri-Food Biotechnology Institute (NABI), Mohali (Jan 18, 2022)
- “*Cytokinin as a bacterial signaling molecule*” at symposium on Molecular Intricacies of Plant Associated Microorganisms (MIPAM 2022) organized by Centre for DNA Fingerprinting and Diagnostics (CDFD), Hyderabad (Feb 17, 2022)
- “*Biotechnology in crop improvement: development of Improved Samba Mahsuri and beyond*” at Acharya N. G. Ranga Agricultural University (ANGRAU), Tirupati (Feb 28, 2022)
- “*Biotechnology in crop improvement*” at Sri Krishnadevaraya University, Anantapur (Feb 28, 2022)

Ramkumar Sambasivan

- “*Cellular model for GNE Myopathy*”, World Without Myopathy- Patient Day Seminar (Sep 18, 2021)
- “*Mechanism triggering bilateral symmetry breaking and left-right patterning in mammals*”, 1st Subhash Mukhopadhyay Symposium (online), Adamas University Kolkata (Jan 14-15, 2022)
- “*Developmental biology: a developing field*”, Invited speaker in the talk series organised by Inventa magazine (science communication platform led by students of IISERs, NISER, CEBS and IISc) (Jan 26, 2022)

Ravi Kumar Pujala

- Guest speaker and chief guest for national webinar on soft condensed matter physics, Sona College of Arts and Science, Salem (Oct 10, 2021)
- “*Mathematics and Physics of Fluids 2021*” jointly organized by the Disciplines of Mathematics and Physics, IIT Gandhinagar (Nov 01-03, 2021)
- “*Self-assembly of nematic colloids*”, Department of Physics, IISER Tirupati (Feb 17, 2022)

Robin V V

- NPTEL Basic Course in Ornithology - Host Institutions: NCF, IISER Mohali, SACON, IISER Bhopal, IISER Tirupati, IISc Bengaluru. Students Enrolled: 5045 (Jan 24, 2022 - Apr 23, 2022)

Sambuddha Sanyal

- "*Multiphase dynamics in certain quasi-periodic systems*"- Young Investigators meet on Quantum Condensed Matter Theory 2021-22, Organised by NISER Bhubaneswar (online talk) (Dec 2021)
- "*Emergent scale and critical dynamics in certain quasi-periodic systems*"- QMAT-2021 (Quantum Matter), 4th National conference on Quantum Condensed Matter, Organised by Tata Institute of Fundamental Research (TIFR), Mumbai (online talk) (Dec 2021)
- "*Multiphase dynamics in certain quasi-periodic systems*"- American Physical Society March Meeting, Chicago, USA (online talk) (Mar 2022)

Sanjay Kumar

- *Crosstalk of TGF- β signaling and Mitochondrial Dynamics*, Department of Zoology, Sri Venkateswara University, Tirupati (Apr 20, 2022)

Shalini Bhattacharya

- *Reduction mod p of Galois representations: an overview*, Early stage mathematician lecture, IWM Annual Conference (Jan 30, 2022)
- *On the reduction of certain Galois representations*, Mathematics Departmental seminar, Ulsan National Institute of Science and Technology, South Korea (Feb 09, 2022)

Shibdas Banerjee

- "*Fishing out elusive species from chemical reactions*" Analytical/Physical Seminar Series (virtual). Department of Chemistry and Biochemistry, Ohio State University, Columbus, USA (Aug 30, 2021)
- "*Propelling Microdroplets for Chemical and Biological Studies*" ASET Colloquium, Tata Institute of Fundamental Research (TIFR), Mumbai (Dec 31, 2021)

Sivakumar Vallabhapurapu

- *Applications of Flow-cytometry in the immune system and cancer*, organized by Department of Zoology, Sri Venkateswara University, Tirupati (Apr 18, 2021)
- *Cell to Cell Communication in Cancer*, Faculty Development Program on Genome Engineering and Technology, Central University of Kerala, Kasaragod (Jan 20, 2022)
- *The NF- κ B System in Life and Death*, Adichunchanagiri University, Javaranahalli, Mandya, Karnataka (Feb 18, 2022)

Sreenivas Chavali

- Scientific Writing and Communication Workshop series organized by Bio Wissen, IISER Tirupati (Apr to Aug 2021)
- *Systems-level understanding of the role of amino acid repeats* at the Mini-symposium on 'Biology in three distinct flavors' organized by Journal of Biosciences, Indian Academy of Sciences (Sep 18, 2021)
- *Navigating the Map of Life* at the two-week international online short-term training program on "Computational Techniques & Applications in Bioinformatics" organized by Maturi Venkata Subba Rao Engineering College (MVSREC), Hyderabad (Sep 13-25, 2021)
- *Protein Structure Prediction and Network Analysis* at the Online Workshop on Molecular data analysis through Bioinformatics tools, organized by Acharya NG Ranga Agricultural University (ANGRAU), Tirupati (Nov 01-10, 2021)
- Rajasthan Science Festival, by DST Rajasthan on Fellowship/Internship application writing for Bachelor and Master students (Feb, 2022)

Subhash B

- 18 Lectures on Topology, Mathematical Training and Talent Search (MTTS) (Jun 12 - Jul 02, 2021)
- Lecture commemorating Pi Day celebrations, Pi Mathematical Association, Chennai (Mar 20, 2022)

Suchi Goel

- *COVID-19-What makes coronavirus successful against humans*, COVID-19: Advances and Remaining Challenge-Webinar, Sri Venkateswara University, Tirupati (2022)

Sudipta Dutta

- *Tunable magnetic states in two-dimensional materials*, CAMOST, IISER Tirupati and IIT Tirupati (Oct 10, 2021)

Sunil Kumar S

- *A story of mysterious molecules in space the diffuse interstellar bands*, ARC: Annual Research Conference 2021

Swarup Roy Choudhury

- *Interaction between Nod factor and its receptor: a key route of molecular communication in legumes*, First International conference on Plant Developmental plasticity-a molecular perspective, Department of Botany and Microbiology Acharya Nagarjuna University, Guntur and IISER Tirupati (Sep 27-29, 2021)
- *Unravelling the interactions between Nod factor and its receptors in chickpea during root nodule symbiosis*, International Symposium on Plant Biotechnology

Towards Improving Agri-Food Industry and Healthcare Products (Hybrid Mode), Birla Institute of Technology, Mesra, Ranchi, Jharkhand (Oct 27-30, 2021)

- *RLKs-mediated activation of root nodule symbiotic pathway*, Molecular intricacies of plant associated microorganisms (MIPAM), An Interactive Meet, Centre for DNA Fingerprinting and Diagnostics (CDFD), Hyderabad (Feb 17-20, 2022)

Tapan Chandra Adhyapak

- *Active particles in suspensions*, Department of Physics, Tezpur University, Assam (Jun 16, 2021)
- *Flagellated active particles in suspensions*, Soft Matter Young Investigators Meet 2021 (Oct 14, 2021)
- *Flagellated active particles in suspensions*, Soft Matter Day, IISER Tirupati (Oct 30, 2021)
- *Making sense of disorder and fluctuations*, Nobel Evening at IISER Tirupati (Oct 30, 2021)
- *Making sense of complexity, disorder and fluctuations*, Regional Science Center, Tirupati (Nov 10, 2021)

Vasudharani Devanathan

- Young investigator meeting organized by India Bioscience (Mar 10, 2022)

Vijayalakshmi V Subramanian

- *Ends: a means to promote meiotic chromosome size bias*, Synopsis lecture series hosted by BITS Pilani, Hyderabad Campus (Dec 01, 2021)
- *Research Ethics and Scientific Integrity*, Ethics Session for IISER Tirupati Students, Online (Mar 19, 2022)

Vijayamohanan K Pillai

- *"Electrocatalytic Applications of 2-D Materials for Electrochemical Energy Storage"* in the International Conference on "Physics and Chemistry of Advanced Materials (PCAM-2021)" at IIT Delhi (Oct 24-27, 2021)
- *"Importance of Two-Dimensional Materials"* in the International Symposium on "Materials of the Millennium: Emerging Trends and Future Prospects" at Pandit Deendayal Energy University, Gandhinagar (Nov 18-19, 2021)
- *"India's Imminent Electric Vehicle Revolution: Challenges and Promises"* - Research Advisory Committee Meeting of Hindustan Petrochemicals - R&D Centre, Bengaluru (Feb 17, 2022)
- *"Battery Battles for EV Supremacy"* - National Science Day Lecture, Maharashtra Academy of Sciences and Centre for Materials for Electronic (C-MET), Pune (Feb 25, 2022)
- *"Impact of Nanotechnology on Industrial Corrosion"* GAIL Corporate R&D Centre, GTI-Noida (Feb 28, 2022)

PARTICIPATION IN CONFERENCES/WORKSHOPS

Ambika G

- 13th Conference on Nonlinear Systems and Dynamics, CNSD2021, SASTRA University, Thanjavur (Dec 17-22, 2021)

Annapurna Devi Allu

- International Symposium, Secrets of stem cells underlying longevity and persistent growth in plants, Nagoya University and Nara Institute of Science and Technology, Japan (Apr 26-28, 2021)
- Epigenetic Mechanisms of Crop Adaptation to Climate Change, EPICATCH COST (Jul 12-14, 2021)
- Symposium on "Plant Developmental plasticity: a molecular perspective" Organized by Acharya Nagarjuna University, Guntur and IISER Tirupati (Sep 27-29, 2021)
- Melbourne - India Post Graduate Program (MIPP) and Melbourne - India Postgraduate Academy (MIPA) Conference (MIPPAC 2022), University of Melbourne, Australia (Feb 03-04, 2022)

Annwasha Dutta

- EPS conference on Statistical Physics of Complex systems organized by the Abdus Salam International Centre for Theoretical Physics (ICTP), Trieste, Italy (Sep 08-10, 2021)

Balaraman Ekambaram

- IP MAXIMA - IPR Awareness for Maximum Reach: A 2-day online workshop organized by CSIR-IMMT: InTEC (Jan 07-08, 2022)
- Innovations in Green & Sustainable Chemistry for Pharma Industry (Jan 19-20, 2022)
- 'Emerging Trends in Catalysis for Sustainable Chemical Processes (ETCSCP-2021)' conference

Chitrasen Jena

- STAR Analysis Meeting (online), at Brookhaven National Laboratory, New York, USA (Jun 28-30, 2021)
- STAR Collaboration Meeting (online), at Rutgers University, New Jersey, USA (Sep 13-24, 2021)
- 65th DAE-Nuclear Physics Symposium (online), at Bhabha Atomic Research Centre (BARC), Mumbai (Dec 01-05, 2021)
- STAR Analysis Meeting (online), at Brookhaven National Laboratory, New York, USA (Dec 06-08, 2021)

- STAR Collaboration Meeting (online), at Brookhaven National Laboratory, New York, USA (Feb 14-25, 2022)
- Pre-QM Meeting (online), at Brookhaven National Laboratory, New York (Mar 22 - Apr 05, 2022)

Debasish Koner

- National Conference on Molecular Modelling and Simulations (NCMMS 2022), at VIT Bhopal University, Bhopal (Feb 28 - Mar 02, 2022)

Eswaraiah Chakali

- 7th South Regional Astronomical Meeting (RAM), on "Research in Astronomy: Opportunities and Challenges VII", Regional Annual Conference of Astronomers, Sponsored by Inter-University Centre for Astronomy and Astrophysics (IUCAA), Pune (Sep 08-10, 2021)

Girja Shanker Tripathi

- 4th BRICS International Conference, IISER Thiruvananthapuram (Dec 07-10, 2021)

Gopinath Purushothaman

- 4th National Conference in Chemistry, Dept. of Chemistry, IIT Gandhinagar (Aug 06-07, 2021)
- E-workshop on Visible Light Organic Transformations, Post Graduate Centre, Jyoti Nivas College, Bengaluru (Oct 23, 2021)

Jessy Jose

- Virtual meeting - ISM 2021: Structure, characteristic scales, and star formation (May 11-14, 2021)
- Regional Astronomy Meeting, Organized by Inter-University Centre for Astronomy and Astrophysics (IUCAA), Pune (Sep 08-09, 2021)
- National conference on Recent Advances in Astrophysics, Organized by University of Calicut, Malappuram, Kerala (Feb 18-19, 2022)

Kanagasekaran T

- Recent Advances and Innovations in Solar Energy (RAiSE), an international conference (Online), Organized by the DST-IITM Solar Energy Harnessing Centre (DSEHC) (Dec 02-04, 2021)
- Nobel Laureate Seminar Series and 11th India-Japan Science Technology Seminar (Online), Organized by Indian JSPS Alumni Association (Dec 06-07, 2021)
- International Symposium on History and Future of Transistors (under the aegis of DBT Star College Program - Online) (Dec 23-30, 2021)

Nandini Rajamani

- CitSci India 2021 Virtual Conference (Sep 13-16, 2021)
- Humboldt Day 2021 (Sep 18, 2021)

Nirmala Krishnamurthy

- STI Ecosystem for AtmaNirbhar Bharat, Organized by Department of Science and Technology, Govt. of India and Andhra Pradesh State Council of Science and Technology (APCOST), Govt. of AP (Online) (Feb 23, 2022)
- ENS-IISER: French-Indian meeting: Exchange of practices on Education and Pedagogical approaches: (Online) (May 10-11, 2021)

Padmabati Mondal

- Theoretical Chemistry Symposium 2021, Organized by IISER Kolkata, S. N. Bose National Centre for Basic Sciences (SNBNCBS), Kolkata and University of Kalyani, West Bengal (Dec 11-14, 2021)

Rakesh S. Singh

- Physical Chemistry Physical Biology (PCPB – 2021), Organized by IIT Bombay, S. N. Bose National Centre for Basic Sciences (SNBNCBS), Kolkata and IIT Tirupati (Sep 24-28, 2021)
- RARE-2021 (An Indo-US bilateral workshop supported by the Indo-US Science and Technology Forum (IUSSTF)) Organized online by IIT Kanpur, TIFR Hyderabad, University of Maryland, USA and University of Chicago, USA (Dec 15-18, 2021)

Ramesh Sonti

- Online symposium on "Plant Developmental plasticity: a molecular perspective" Organized by Acharya Nagarjuna University, Guntur and IISER Tirupati (Sep 27-29, 2021)
- Newton Bhabha Fund Researcher Link Workshop on Sustaining Food Production under environmental stress, Organized by National Agri-Food Biotechnology Institute (NABI), Mohali (Jan 18-21, 2022)
- Symposium on Molecular Intricacies of Plant Associated Microorganisms (MIPAM 2022), Organized by Centre for DNA Fingerprinting and Diagnostics (CDFD), Hyderabad (Feb 17-20, 2022)

Ramkumar Sambasivan

- World Without Myopathy- Patient Day Seminar (online), Ashoka University, National Capital Region (NCR), Sonapat, Haryana (Sep 18, 2021)
- 1st Subhash Mukhopadhyay Symposium (online), Adamas University, Kolkata (Jan 14-15, 2022)

Ravi Kumar Pujala

- The 5th Edwards Symposium on Future Directions in Soft Matter (online), Centre for Mathematical Sciences, Cambridge, UK (Sep 08-10, 2021)
- "Soft Matter: Young Investigators e-Meet 2021 (e-SMYIM)", IISER Tirupati, IIT Bombay and IISc Bangalore (Oct 2021)

- "Characterization of Magneto-rheological Fluids" (online webinar), Anton Paar (Oct 2021)
- Conference on "Accelerated Particles in Physics (APP - 2022)" (Jan 02-04, 2022)
- "Rheo-Optics: An Essential Toolbox for Rheological Investigations of Complex Fluids" (online webinar), Anton Paar (Mar 2022)

Sambuddha Sanyal

- Young Investigators Meet on Quantum Condensed Matter Theory 2021-22 (online meeting), Organised by National Institute of Science Education and Research (NISER), Bhubaneswar (Dec 2021)
- QMAT-2021 (Quantum Matter), 4th National conference on Quantum Condensed Matter (online meeting), Organised by Tata Institute of Fundamental Research (TIFR), Mumbai (Dec 2021)
- American Physical society March Meeting (online meeting), Chicago, USA (Mar 2022)

Shalini Bhattacharya

- Indian Women and Mathematics (IWM) Annual Conference, Banasthali Vidyapith, Jaipur (Jan 28-30, 2022)

Sivakumar Vallabhapurapu

- Hands on Training Workshop on Flow Cytometry, Organized by Department of Zoology, Sri Venkateswara University, Tirupati (Apr 18, 2021)

Souradeep Majumder

- Discussion Meeting on Vector Bundles 2022, Tata Institute of Fundamental Research (TIFR), Mumbai (Mar 28-Apr 01, 2022)

Sreenivas Chavali

- Online Workshop on Molecular data analysis through Bioinformatics tools, Organized by Acharya N G Ranga Agricultural University (ANGRAU), Tirupati (November 01-10, 2021)
- Mini-symposium on 'Biology in three distinct flavors', Organized by Journal of Biosciences, Indian Academy of Sciences (Sep 18, 2021)

Sunil Kumar S

- Annual Research Conference 2021 (online) at Mahatma Gandhi University, Kottayam, Kerala (Feb 21-22 & 25, 2022)

Swarup Roy Choudhury

- 1st International conference on Plant Developmental plasticity-a molecular perspective, Organized by Department of Botany and Microbiology, Acharya Nagarjuna University, Guntur and IISER Tirupati (Sep 27-29, 2021)

- International Symposium on Plant Biotechnology Towards Improving Agri-Food Industry and Healthcare Products (Hybrid Mode), Birla Institute of Technology, Mesra, Ranchi, Jharkhand (Oct 27-30, 2021)
- Molecular intricacies of plant associated microorganisms (MIPAM), An Interactive Meet. Centre for DNA Fingerprinting and Diagnostics (CDFD), Hyderabad (Feb 17-20, 2022)

Tapan Chandra Adhyapak

- Soft Matter Young Investigators Meet 2021 (Oct 14-16, 2021)
- Nobel Prize in Physics 2021, Tamil Nadu Science Forum (Oct 16, 2021)
- Soft Matter Day, IISER Tirupati (Oct 30, 2021)
- Nobel Evening, IISER Tirupati (Oct 30, 2021)
- Nobel Lectures in Physics 2021, Regional Science Centre, Tirupati (Nov 10, 2021)

Utpal Saikia

- American Geophysical Union (AGU), hosted by International Earth Science Community, New Orleans, Louisiana, USA (Dec 13-17, 2021)

Vijayalakshmi V Subramanian

- Phase Separated Systems in the Nucleus (Online Conference), hosted by IISER Pune and Indian Academy of Sciences (Apr 06-09, 2021)
- MAYosis, Weekly online conference on meiosis, hosted by Cornell University, Ithaca, New York, USA (May 06-Jun 03, 2021)
- EMBO Laboratory Leadership Workshop, Online workshop hosted by EMBO and DBT/Wellcome Trust India Alliance (Nov 15-18, 2021)

SCIENTIFIC EVENTS ORGANISED

Ambika G

- Seminars under Veekshana, the forum for women faculty members and scientists of IISER Tirupati
- Global breakfast event, and seminars on International Women's day

Ashwani Sharma

- Mini-Symposium on Nucleic Acids (Virtual Meeting) at IISER Tirupati (May 25, 2021)

Balaraman Ekambaram & Soumit Mondal

- Mole Day Celebration at IISER Tirupati (Oct 23, 2021)

Chitrasen Jena

- ALICE-STAR-India Collaboration Meeting (online) at Panjab University, Chandigarh (Aug 17-20, 2021)

Eswarayya Ramireddy

- International Webinar on Plant developmental Plasticity: A molecular perceptive, Jointly organised by Acharya Nagarjuna University, Guntur and IISER Tirupati (Sep 27-28, 2021)

Lakshmi Lavanya R

- Inter IISER-NISER Mathematics Meet (IINMM) 2021 (online), hosted by IISER Tirupati (Jul 12-14, 2021)

Nirmala Krishnamurthy

- ENS, France-IISER virtual Meeting on “Pedagogy and Online Teaching Practices” (May 10-11, 2021)
- Scientific Session with Kendriya Vidyalaya (Online), Tirupati (Feb 05, 2022)

Raghunath O Ramabhadran

- Seminar on behalf of the Center for Career and Professional Development (CCPD), Chemistry: A Challenging and Rewarding Career Option (Nov 20, 2021)

Rajesh Viswanathan

- IISER Tirupati - IIT Tirupati - KREA University, Sri City, AP - Workshops on Academic Collaborations (Mar 2022)

Raju Mukherjee

- ENS, France-IISER virtual Meeting on “Pedagogy and Online Teaching Practices” (May 10-11, 2021)

Ravi Kumar Pujala

- Soft Matter: Young Investigators e-Meet 2021 (e-SMYIM 2021), Organized by IISER Tirupati, IIT Bombay and IISc Bangalore (Oct 14-16, 2021)

- Soft Matter Day, IISER Tirupati – a half day conference organized as part of the Physics Day 2021, IISER Tirupati (Oct 30, 2021)

Robin V V

- Humboldt Day 2021 (Online event) - Indian Biogeographers organized a set of talks from leading biogeographers from across the globe. Organized by National Centre for Biological Sciences (NCBS), Bengaluru, Indian Institute of Science Education and Research (IISER) Tirupati, and CSIR- Centre for Cellular and Molecular Biology (CCMB), Hyderabad (Sep 18, 2021)

Souradeep Majumder

- Inter IISER-NISER Mathematics Meet (IINMM) 2021 (online), hosted by IISER Tirupati (Jul 12-14, 2021)

Sunil Kumar S

- Short online course on *Introduction to Quantum Optics*, IISER Tirupati (Jul 19-30, 2021)
- CAMOST First Anniversary Colloquium Series (five distinguished speakers), Center for Atomic, Molecular, and Optical Sciences & Technologies (CAMOST), a joint initiative of IISER Tirupati and IIT Tirupati (Aug 16-20, 2021)

Tapan Chandra Adhyapak

- Soft Matter Day, IISER Tirupati – a half day conference organized as part of the Physics Day 2021, IISER Tirupati (Oct 30, 2021)

Vasudharani Devanathan

- Synapse 2021, Annual neuroscience symposia organized by IISER Tirupati; 2021 Edition of Synapse organized in collaboration with IISER Thiruvananthapuram (Dec 03-04, 2021)

Vijayalakshmi V Subramanian

- Biology Research Seminar Series for Students and Post-Doctoral Research Fellows



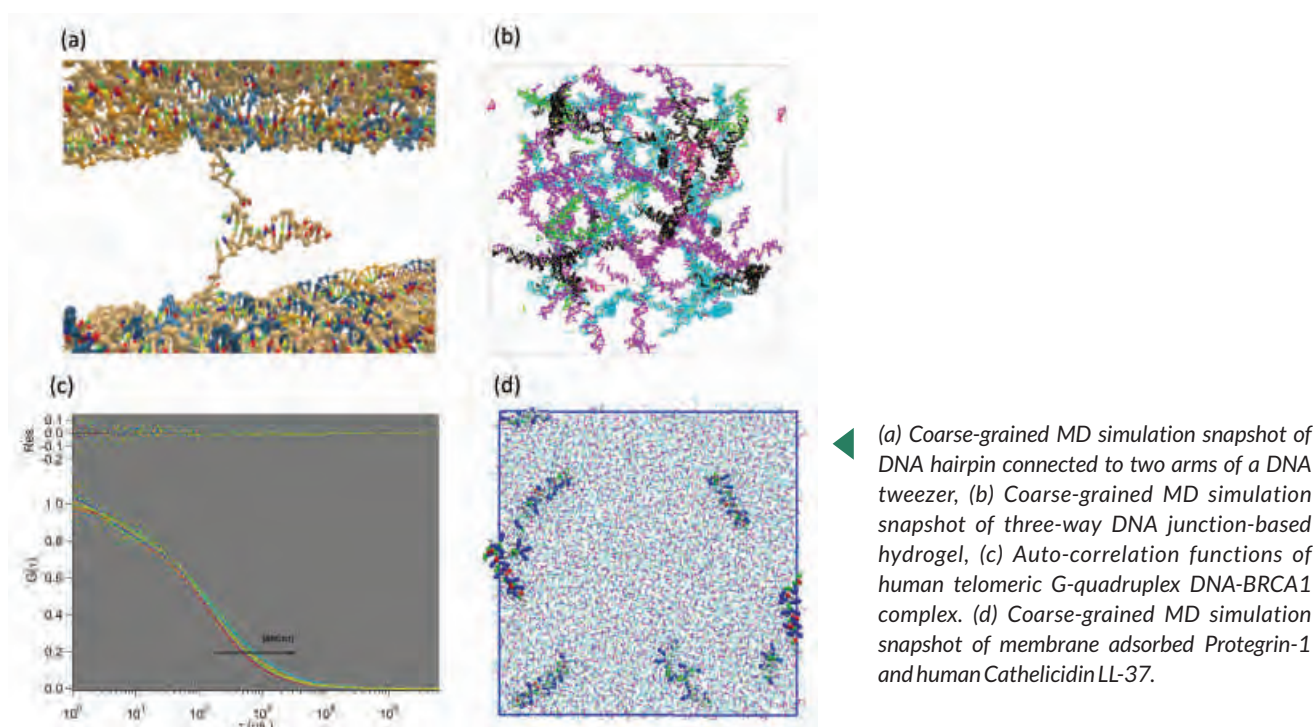
1. BIOLOGY

Biological sciences research at IISER Tirupati spans the entire dimensional scale of the life sciences, from molecules to populations and ecosystems. Research in the department is woven around seven major thematic areas. 1. Biophysics and Structural Biology; 2. Genome Biology and Computational Biology; 3. Infectious diseases; 4. Cancer Biology and Immunology; 5. Developmental Biology and Neurobiology; 6. Plant Biology, including plant-microbe interactions; 7. Ecology and Evolution. The subjects of research are a range of organisms, including bacteria, yeast, plants, birds, mammals, etc. Despite disruptions caused by the ongoing COVID pandemic, much progress has been made in all of these areas of work. In addition, it is gratifying to report that the Science and Engineering Research Board (SERB) has sanctioned a competitive grant for establishing a BSL-3 facility at IISER Tirupati. The research on infectious diseases at IISER Tirupati is expected to have a major fillip on account of this facility. The plant sciences research centre, including tissue culture facilities, growth chambers, growth rooms and greenhouses, is being established on the permanent campus, and members of the plant sciences group have commenced their research activities in this facility. It is expected that this centre will not only conduct basic research in the plant sciences but also interact with concerned stakeholders to develop products of relevance to agriculture. In-house facilities and linkages with national facilities are being established to enable high-quality structural biology research in the department. The ecology group, in addition to doing high-quality research, is also actively involved in citizen science initiatives aimed at enhancing awareness about the importance of cataloguing and conserving biodiversity. Biology @IISER Tirupati is in a vibrant mode, and the future holds tremendous promise. This report provides a summary of departmental research activities.

1.1 Biophysics and Structural Biology

Over the last year, **Dr Nibedita Pal's** lab primarily focused on exploring nucleic acid-based functional structures. One of the projects focuses on the DNA hairpin formation induced actuation of a dynamic DNA tweezer through coarse-grained molecular dynamics (MD) simulations. The study showed DNA tweezer arms closure as a DNA hairpin is formed (Fig 1a). Another coarse-grained MD simulation study explored the hydrogel formation from a three-way DNA junction as a unit (Fig 1b). Interestingly, it was found that the inter-duplex angle changes as a longer and longer polymer chain is formed through sticky-end cohesion. In a network-like structure, three-way DNA junctions adopt more like a planer structure.

Higher-order DNA structures are often targets for protein binding and often plays important role in disease regulations. One such important structure is DNA G-quadruplex. Employing a single-molecule Fluorescence Correlation Spectroscopy, the research group has explored the interaction of the tumour suppressor protein BRCA1 with human telomeric G-quadruplex DNA. This is one of the first studies to directly explore the kinetics of formation of BRCA1-G- quadruplex complex. Besides focusing on DNA, the group explored the synergism between antimicrobial peptides Protegrin-1 and human Cathelicidin Antimicrobial Peptide LL-37 while interacting with membranes. The coarse-grained MD simulation study showed that the aggregation is highly accelerated when two types of peptides interact with each other. This, in turn, accelerates the interaction with the membrane itself.



Currently, **Dr Hussain Bhukya's** main research focus is to elucidate the structural basis of the transcription regulators (TRs) involved in the biosynthesis of specialised secondary metabolites (SSMs), bafilomycin and virginiamycin from *Kitasatospora satae* and *Streptomyces virginiae* respectively. The SSMs are produced by a modular mega-enzyme assembly line, and their production is tightly regulated by TRs responding to the signaling molecule. Structural characterization of TR-DNA and TR-ligand complex structures would facilitate gene manipulations that would lead to the overproduction of these SSMs at an industrial scale.

Moreover, the group is employing a machine learning approach to train the model on TR-DNA complex dataset to enable the prediction of the binding affinity (K_D) and the change in the interaction energy (ΔG). These *in-silico* predictions are anticipated to help design effective experimental studies for the desired outcome.

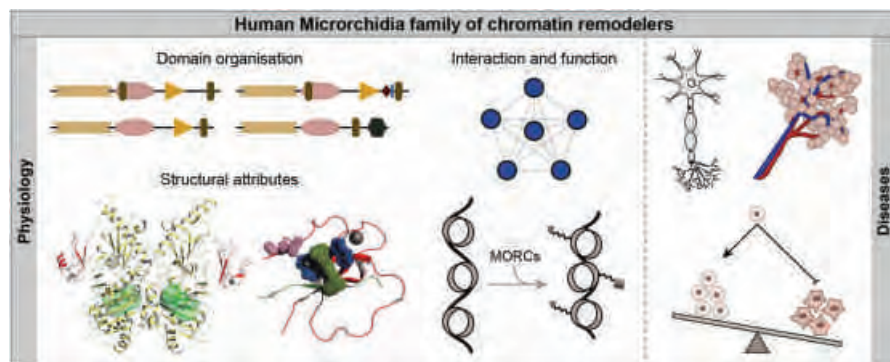
Another aspect of Dr Bhukya's research is investigating plant immune response mechanisms. Pathogens rely on various strategies to invade plant innate immune systems, and to successfully defend against this, plants have developed a multilayered defense mechanism. The primary layer of defense is triggered when the cell surface receptors sense a pathogen-associated molecular pattern. To suppress this, the pathogen injects its effector molecules into the plant cell via a type III secretion system. The host plant's cytosolic resistance proteins/nucleotide-binding leucine-rich repeat receptors (NLRs) perceive these effectors and activate a secondary layer of defense, known as effector-triggered immunity. NLRs detect diverse effectors and activate immune responses. However, little is known about the structural basis of this action. It is essential to investigate further to completely understand plant immune response in order to maximize global food security by minimizing crop loss.

1.2 Genome Biology and Systems Biology

Infertility, spontaneous fetal loss and birth defects in humans result mainly from mistakes in chromosome inheritance during meiosis, the cell division that forms eggs/sperm. Faithful inheritance in meiosis requires links between homologue pairs created by induction of numerous programmed DNA breaks and repair of these breaks as crossovers. Consequently, proper distribution of DNA breaks to all chromosomes and appropriate repair are critical for the fidelity of their inheritance and, therefore, for the preservation of

fertility. **Dr Vijayalakshmi Subramanian's** research group is interested in investigating the mechanisms that promote fidelity of chromosome inheritance as well as genome integrity during meiosis using budding yeast as a model organism. DNA break and repair mechanisms in meiosis are fundamentally conserved, and findings in model organisms will have a direct impact on the understanding of chromosome inheritance in humans. These studies will impact the understanding of mechanisms of genetic diversity and fertility.

Dr Sreenivas Chavali's group focuses on unravelling the design principles underlying protein functionality. For this, they use computational and experimental approaches to decipher the impact of variation on the regulation and molecular function(s) of proteins. Specifically, they investigate the impact of variation in the structured regions and intrinsically disordered segments distinctly. As a part of this endeavor, they investigated a relatively new family of chromatin remodelers. Chromatin remodelers affect the spatio-temporal dynamics of global gene expression by structurally modulating and/or reorganising the chromatin. Microorchidia (MORC) family is a relatively new addition to the four well-studied families of chromatin remodelling proteins (SWI/SNF, ISWI, CHD and INO80). They examined the structural aspects of human MORCs and their epigenetic functions. Specifically, they show that the well-studied MORC2 lacks the conserved aromatic cage in the Zinc Finger CW (ZF-CW) domain that accommodates the modified histone tail (H3K4me3) in MORC3 and MORC4. However, MORC2 has an additional domain, the chromo-like domain, whose functionality in binding to histone tails remains to be tested. From a molecular and systems-level perspective, they explore the participation of different MORCs in phase-separated structures, protein complexes, possible influence on various biological processes through protein-protein interactions, and potential extra-nuclear roles. By collating evidence from literature, they have provided mechanistic insights into how dysregulation/dysfunction of MORCs can lead to various pathological conditions. Such integrated efforts would aid in obtaining a structural as well as a holistic understanding of the various biological roles of MORCs and aid in developing intervention strategies against human diseases affected by genetic or abundance alterations of MORCs.



◀ Elucidating the structural and functional attributes of Microorchidia family of chromatin remodelers can be employed to develop intervention strategies for human diseases resulting from dysregulation or dysfunction of MORCs.

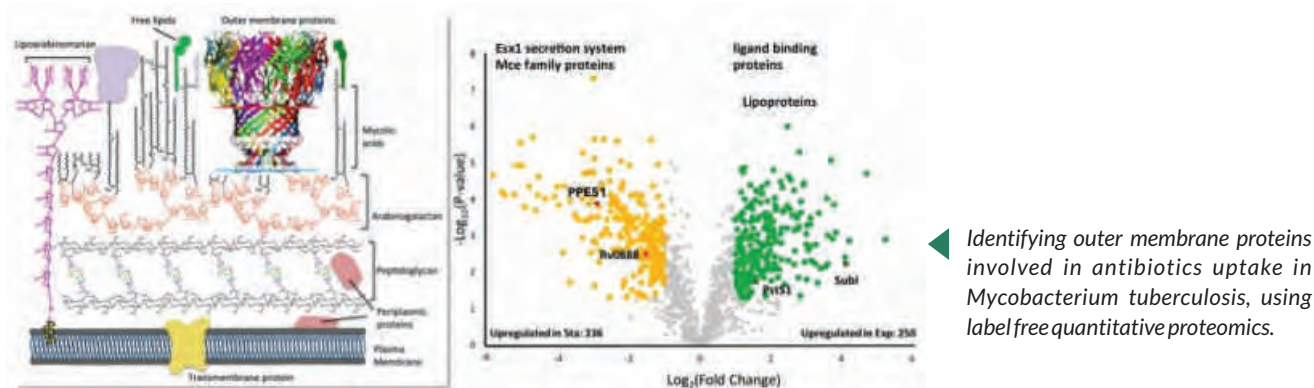
1.3 Infectious Disease Biology

Dr Raju Mukherjee's group is working on understanding small molecule permeation in *Mycobacterium tuberculosis* which can be useful for the rational design of future drugs with higher penetration. Transport of nutrients across the bacterial inner membrane has been extensively studied; however, the mechanism by which nutrients permeate across the extraordinarily thick hydrophobic mycomembrane is poorly understood. The group has been able to extract and characterize the outer membrane proteome of *M. tuberculosis* and identify key outer membrane proteins (OMP), including 'porins' with a potential for a role in nutrient and antibiotic uptake. They employed two screens involving label-free quantitative mass spectrometry (nano-LCMS) and high-density transposon mutagenesis followed by massively parallel sequencing. They correlated

the proteomic findings with the number of SNPs observed in the coding regions of the OMPs in mono- and multi-drug resistant clinical isolates. After that, they validated the role of 12 selected OMPs through their overexpression in *M. tuberculosis* and localization on the cell surface. Alteration in EtBr uptake and antibiotic uptake were observed through drug susceptibility assays. They propose the role of Rv1235 and Rv3759 in facilitating the uptake of aminoglycosides.

The group has developed a method for generating a high-density transposon mutant library in *M. tuberculosis*. The high coverage of the library allowed identifying new essential features of the coding sequences in the genome, including newly annotated stable RNAs. Through continuous culturing of the mutant library, they observed temporal fluctuation in genetic essentiality during optimal growth in the absence of any selection pressure. They observe high fluctuations in genes involved in cell wall processes, intermediary metabolism and virulence suggesting new modes of adaptation. Genes responsible for imparting morphological and physiological heterogeneity and those involved in metabolic bypass were gradually lost from the population, implying their importance in mycobacterial physiology and survival.

In another project, the research group tried to understand the nature, quantum and sequence of adaptive events leading to antibiotic tolerance in mycobacteria, which is an essential goal for TB researchers while developing resistant-proof therapeutics. They performed temporal proteomics in response to antibiotics (aminoglycosides and fluoroquinolones) and observed links between metabolic alterations and drug susceptibility mediated by reactive oxygen species (ROS). Functional enrichment analysis in response to both drugs revealed downregulation of ribosomal proteins, DNA replication, transcription, translation and cell division processes. Further, they observed an up-regulation of SOS response proteins, various ROS mitigating enzymes, and rewiring of the central carbon metabolism possibly intended to reduce oxidative phosphorylation and ROS production. Importantly, they observed around 50% overlap between differentially expressed proteins in response to two distinct antibiotics, suggesting a commonality in the mechanism of drug action and bacterial response. They hypothesise that adaptive metabolic remodeling minimises redox-related alterations and cellular metabolic activities required for antibiotic lethality and that this is at the core of survival tactics and antibiotic tolerance in mycobacteria.



Dr Suchi Goel's group studies infectious disease biology, specifically focusing on the molecular and cellular biology of the malaria parasite. Global warming has enhanced malaria transmission rates due to the extended duration of mosquito prevalence leading to increased contact rates with humans. This has led to an increase in *Plasmodium falciparum* cases responsible for a lethal form of malaria. The virulence of *P. falciparum* is due to the formation of agglutinates of uninfected and parasitized RBCs in the blood vessels. The large agglutinates block the blood flow and cause severe malaria. Further, human serum proteins alleviate the severity by increasing the size of agglutinates and the binding affinity of agglutinates. The research group recently observed that this severity could be serum-independent. They identified a new PfEMP1 variant that binds to glycophorins,

forming large agglutinates. It is important to note that glycophorin variants, Dantu and S-s-U- RBCs are protected against severe malaria, suggesting that the study has significant implications in decoding the role of MNS antigens in severity.

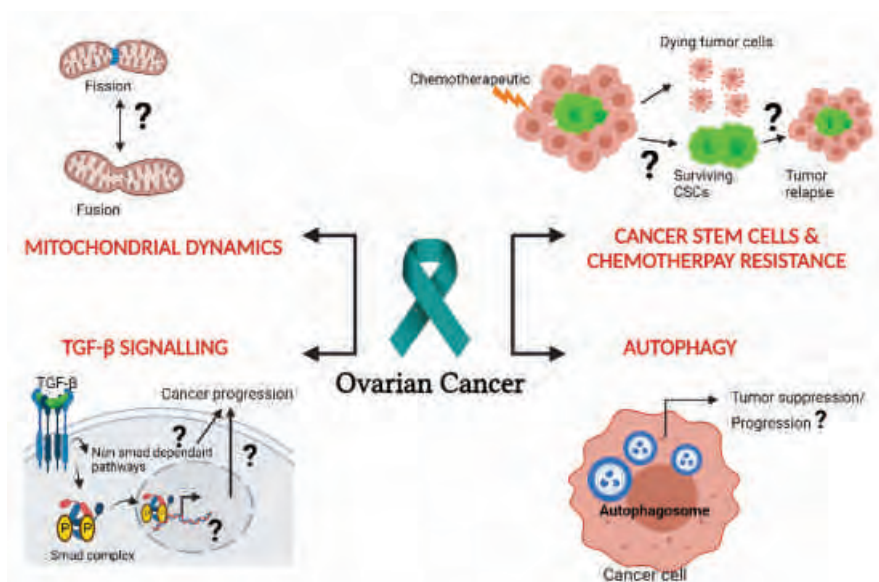
1.4 Cancer Biology and Immunology

Apoptosis suppression is central to cancer progression. Gaining mechanistic insights into apoptosis suppression would help us develop targeted approaches to induce apoptosis and prevent cancer growth. While NF- κ B has largely been shown to be transcriptionally active, **Dr Sivakumar Vallabhapurapu's** research group has found some novel transcriptional repressive complexes that repress proapoptotic genes Bim and BMF in multiple myeloma and thereby contribute to apoptosis evasion. Efforts are in place to identify small molecule inhibitors to target the transcriptional repressive complexes formed by NF- κ B with a long-term goal of developing targeted myeloma therapy. While Bim and BMF were found to be important tumour suppressors in myeloma, they play an essential role in anoikis resistance in metastatic cancers. While both Bim and BMF are known to be involved in anoikis resistance, the mechanism of repression of these genes in different solid tumours might be different. The group is focused on studying how NF- κ B and its cross-talk with other signals and molecules contribute to anoikis resistance in solid tumours. In addition to understanding the role of transcriptional repression by NF- κ B in cancer, the physiological importance of NF- κ B-mediated transcriptional repression in the immune system is unknown and needs to be studied in detail. To this end, efforts are in place to generate appropriate transgenic and knock-in mouse models, which would address the physiological significance of cross-talk between NF- κ B and other signalling pathways and explain how transcriptional repression by NF- κ B contribute to the normal homeostasis of the immune system.

Microrchidia family CW-type zinc finger 2 (MORC2) is a recently identified chromatin modifier with an emerging role in cancer metastasis. **Dr Suresh Pakkala Babu's** research group explores its role in glucose metabolism, a hallmark of malignancy. They found that MORC2 is a glucose-inducible gene and a target of c-Myc. Meta-analysis revealed that MORC2 expression was positively correlated with the expression of enzymes involved in glucose metabolism in breast cancer patients. Further, overexpression of MORC2 in breast cancer cells augmented the expression and activity of a key glucose metabolism enzyme, Lactate Dehydrogenase A (LDHA). Conversely, selective knockdown of MORC2 by siRNA markedly decreased the LDHA expression and activity and, in turn, reduced cancer cell migration. These findings provide evidence that MORC2, a glucose-inducible gene, modulates the migration of breast cancer cells through the MORC2- c-Myc-LDHA axis.

Further, their research demonstrated that MORC2 also modulates the β -catenin signalling cascade in breast cancer cells. Most importantly, c-Myc, the target gene of β -catenin, was found to regulate the MORC2- β -catenin signalling axis through a feedback mechanism. The group demonstrated that MORC2 regulates β -catenin expression and function by modulating the phosphorylation of AKT. In addition, they observed reduced proliferation and migration of MORC2 overexpressing breast cancer cells upon β -catenin inhibition. Overall, the results demonstrate that MORC2 promotes breast cancer cell proliferation and migration by regulating β -catenin signalling. Currently, the research group is focused on understanding the role of MORC2 in cancer metabolism and metastasis.

Dr Sanjay Kumar's group is trying to understand the complex molecular events involved in ovarian cancer progression and stem-cell-dependent drug resistance while identifying valuable therapeutic targets. The group recently identified that TGF- β activates KLF8 through the Smad2 signaling pathway and that activated KLF8 contributes to ovarian cancer progression. Imbalanced mitochondrial dynamics lead to mitochondrial dysfunction and contribute to ovarian cancer progression. Dr Kumar's lab identifies the mechanism of how imbalanced mitochondrial dynamics regulators contribute to ovarian cancer progression.



◀ Schematic representation of recent highlights from Dr Kumar's group

1.5 Developmental Biology and Neurobiology

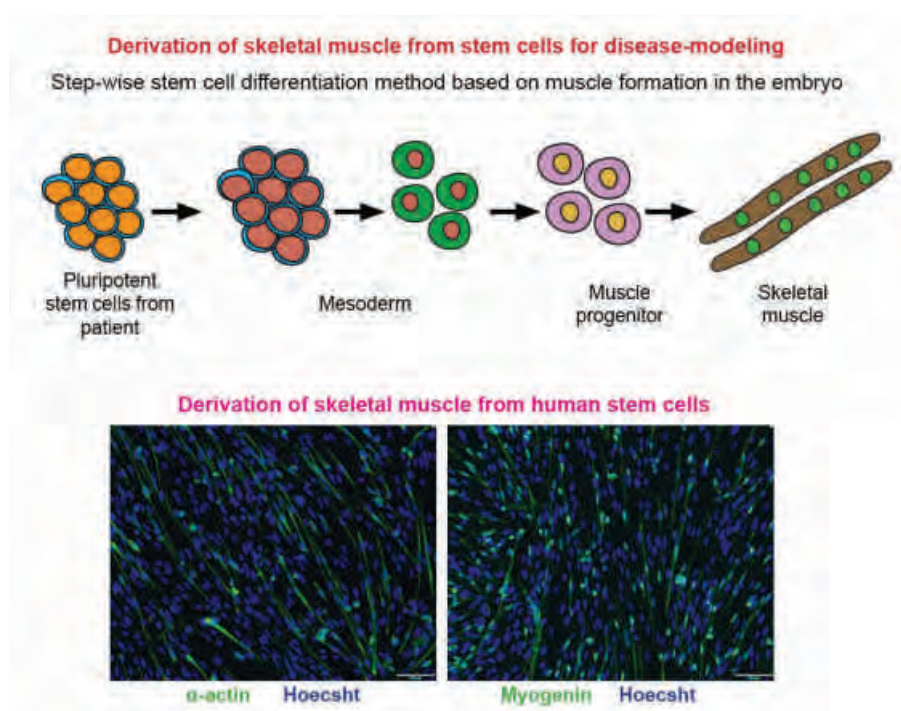
Extension of axonal and dendritic processes in the CNS is tightly regulated by outgrowth-promoting and inhibitory cues to assure precision in synaptic connections. Studies on neurite formation and extension (neurite outgrowth) are often restricted to the neurons of the brain, such as cerebellar, hippocampal, and cortical neurons. However, neurons display a high level of functional variation based on their tissue distribution. **Dr Vasudharani Devanathan's** research group goes one step beyond in an attempt to systematically annotate and understand neurite outgrowth processes in neurons of the adult mammalian CNS (Brain and Retina). This will allow them to understand and explore cellular similarities and variations in adult-borne neurons of the CNS in its entirety.

Neuronal transmembrane proteins (NTM) such as Neuronal Cell Adhesion Molecule (NCAM), Prion protein Protein Cellular (PrPc) and Contactin-Associated Protein (Caspr1/Paranodin) are involved in the orchestration of neurite regulation. Micromanagement of neurons by NTM's is critical for the extension and contraction of neuronal processes, which leads to the formation of synapses. These proteins are located as clusters at specific sites on the neuronal cell membrane to enhance local cellular functions rapidly. The expression of these proteins is altered during altered metabolic conditions (data from this group). From the data published from IISER Tirupati, it is evident that these proteins have significant roles during altered metabolism. The different research directions focus on understanding the impact of metabolic stress in adult retinal neurons and its implications in diabetic retinopathy, determining the effect of hypoxia in adult-borne neurons and how this contributes to traumatic brain injury and brain stroke and the effect of altered glucose levels in cerebellar neurons/cortical neurons and the implications in neurodegeneration (Early onset of Alzheimer's) resulting from long-term Diabetes.

This research will be impactful both nationally and internationally, given that Diabetes is on the increase. The research outcomes of the lab will explicitly demonstrate how neurons behave and respond to long-term glucose insult.

Dr Ramkumar Sambasivan's research group aims to understand how functionally specialized cell types are formed during embryonic development in mammals. They then leverage this knowledge to design stem cell technologies to develop disease models and regenerative therapeutic approaches.

In stem cell research, developing methods to guide the differentiation of pluripotent stem cells into skeletal muscle cells is an advanced technique. Such guided-differentiation methods will have a significant impact on research in muscle-wasting diseases known as myopathies. Dr Sambasivan's laboratory is a part of a consortium of research groups in India to build research and clinical capacity for tackling rare myopathies such as GNE myopathy and Agarwal Limb-Girdle Muscular Dystrophy. One of their contribution to the consortium would be cell-based disease models. On the foundation of their research in early embryonic development, the group has gained expertise in cutting-edge muscle differentiation methods. In the last year, they succeeded in driving the differentiation of human pluripotent stem cells towards skeletal muscle (see Figure). Now, they plan to replicate this method in patient-derived cells to develop a cellular model for GNE myopathy. The model would then be used to study the mechanism of this rare disease and thus, will lead to the development of therapy.



◀ Schematic of the guided differentiation method of muscle fibers from human pluripotent stem cells. The step-wise signal pathway modulation and growth factor treatment of the differentiation method is designed to mimic the sequence of embryonic skeletal muscle development. Bottom panels are representative fluorescence micrographs of immunostained differentiation cultures showing muscle fibers differentiated from human pluripotent stem cells. Myogenin is a transcription factor, which drives and maintains muscle differentiation. α -actinin is a component of the contractile apparatus, which underlies muscle function, Scale bar 100 μ m.

1.6 Plant Biology

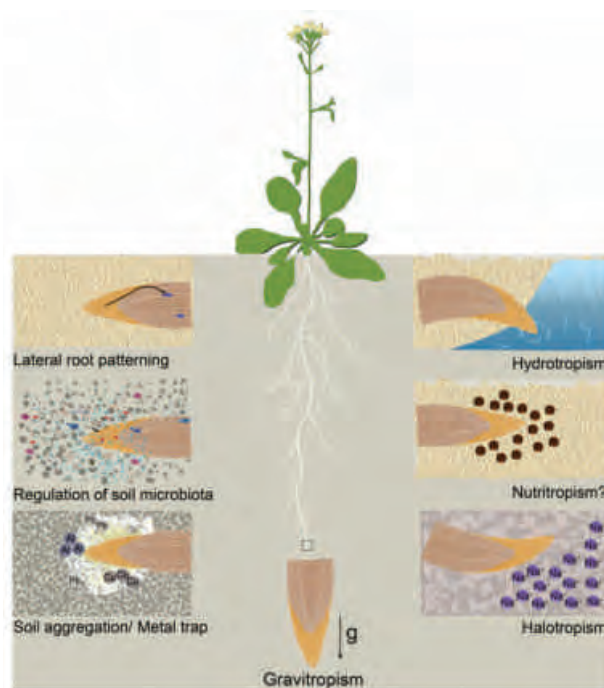
Dr Annapurna Devi Allu's research focuses on unravelling the molecular regulatory mechanisms underpinning plant response to abiotic stresses (in particular, drought and heat). The frequency and intensity of drought and high-temperature stresses have been increasing in the recent past, threatening crop productivity and global food security. More importantly, these stresses often co-occur under field conditions, and their combined impact on plant growth and survival is higher than any single stress. Hence, understanding the molecular basis of plant response to the combination of drought and heat is paramount for ensuring food productivity under changing climatic conditions. Using reverse and forward genetics approaches, Dr Allu's group has identified transcription factors (TFs) that are potentially involved in the regulation of plant response to combined drought and heat stress in *Arabidopsis*. Functional characterisation and identification of those TF-gene-regulatory networks are in progress. Further, Dr Allu's group is working on studying the effects of combined drought and heat stress on the important staple food crop, rice.

Dr Allu's group is also engaged in identifying "molecular elements" that modulate priming-mediated acquired thermotolerance and the duration of stress memory in plants, using *Arabidopsis thaliana*, rice (*Oryza sativa* L.) and Indian mustard (*Brassica juncea* L.) as model systems. 'Priming' is a mechanism where pre-exposure to mild

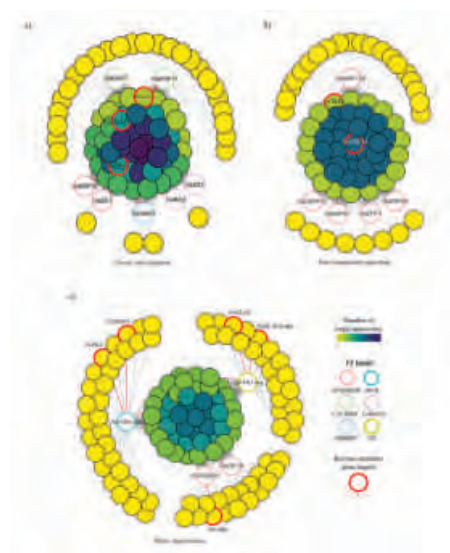
stress or a signalling stimulus enables the plant to mount a robust response upon encountering subsequent stress. The study aims to gain insights into the regulatory mechanisms underlying thermoprime-mediated acquired thermotolerance (short- and long-term acquired thermotolerance). They have identified proteins that regulate chromatin dynamics in modulating plant-acquired thermotolerance (work in progress). Further, they are working on a model to introduce 'priming' as an agricultural management tool to improve stress tolerance in crop plants in field conditions, explicitly focusing on heat stress in the reproductive stage of rice plants.

Using *Arabidopsis* as a model plant, **Dr Eswarayya Ramireddy's** group is actively pursuing the question of how the root cap acts as an epicentre for sensing environmental cues and fine-tuning root growth towards adaptation. What are the gene networks underlying this process? To this end, the group performed root cap-specific proteomics upon salt stress using FACS and LC-MS. The analysis shows that the root cap is an active center in the perception and signal transduction of salt stress. The study identified several proteins involved in protein metabolism, stress responses, ROS scavenging and ER-mediated UPR responses compared to non-root cap cells. Further, it identified protein interactome clusters operating in root cap cells, specifically under salt stress. This is the first study to unravel the proteome landscape of root cap cells under control and stress conditions like salt and cadmium.

The multifaceted functions of root cap in the rhizosphere.



Food security will be a massive problem in the future, and the yield of crop plants needs to be increased by at least 50% by 2050. Researchers worldwide identified QTLs and some regulatory genes that contribute to rice yield. Dr Ramireddy's group, in collaboration with the local ANGR agricultural University, is working to develop resilient rice varieties for a sustainable future. Among *japonica* and *indica* genotypes, *indica* rice varieties are largely cultivated across the globe. However, the present understanding of yield-contributing gene information stems mainly from *japonica* and studies on the yield potential of *indica* genotypes are limited. The study tries to establish the role of known yield-related genes that have been characterized in *japonica* cultivars in the popular Indian *indica* cultivars. To this end, the study has identified conserved regulatory components for yield-related traits in the *indica* rice group with previously identified yield-related genes from *japonica*. This study identifies some *indica* genotypes as donors for high-yielding breeding programs based on yield gene expression analysis and SNP-metabolites associations.



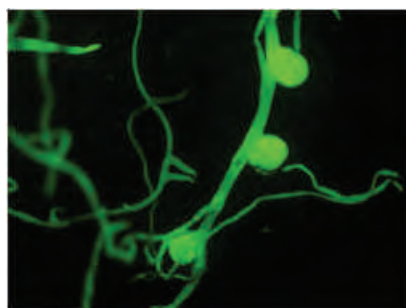
Putative yield-associated regulatory TF-target interaction network in the indica rice group.

Among the abiotic stresses, drought is one form of natural calamity that adversely affects crop cultivation. It triggers various physiological and biochemical responses in plants, including suppression of plant growth and photosynthesis, stomatal closure and cuticle wax formation, thus affecting plant yield. Drought stress forces the plant to make adaptive changes to survive, presumably modulated by intricate genetic networks. Using a transcriptome-based approach, **Dr Swarup Roy Choudhury's** group has identified drought stress-responsive genes in the desiccation tolerance *Selaginella species*, an ancient lineage of vascular plants. Further functional analysis of these genes will improve crop cultivation with better drought tolerance.

The second line of research focuses on legume-rhizobium symbiosis, where a complex signal exchange between rhizobia and legumes leads to root nodule formation on the roots of host plants. The nodule formation is a complex cellular and developmental event, which is regulated through Nod factor receptor (NFR)-mediated genetic networks. Although some evidence about NFRs is known in model legumes, the mechanistic functional roles of receptor kinases and their downstream targets are obscure. Currently, the research group is investigating the characteristic features of NFRs in crop legumes to understand the impact of phosphorylation on the activation of receptor-like kinases. In addition, they are searching for downstream targets of NFRs to unravel the unidentified signalling route essential for root nodule symbiosis.



A



A. *Selaginella bryopteris* is a lycophyte resurrection plant.

B. Transgenic GFP root is generated by hairy root transformation.

Dr Ramesh Sonti's group studies bacterial virulence functions and plant innate immune responses during the interaction between rice and the bacterial pathogen *Xanthomonas oryzae* pv. *oryzae* (Xoo). The Xoo bacterium secretes plant cell wall degrading enzymes (CWDEs) that are important for virulence, but their action in damaging cell walls triggers Pathogen Triggered Immunity (PTI) in rice. In order to be able to cause disease, the

Xoo bacterium suppresses PTI using four bacterial type 3 secretion system (T3SS) secreted proteins, namely Xanthomonas outer protein N (XopN), XopQ, XopX and XopZ. Interestingly, they find that two of these proteins, XopQ and XopX, interact with each other and that this interaction inside rice cells leads to the induction of rice innate immune responses that are analogous to effector-triggered host immunity (ETI). The Xoo pathogen secretes five additional T3SS-secreted proteins (namely XopU, XopV, XopP, XopG and AvrBs2), each of which can individually suppress ETI. These results indicate that the Xoo bacterium employs multiple T3SS-secreted effector proteins to suppress both arms of the plant's innate immune system, namely PTI and ETI, during infection.

1.7 Ecology and Evolution

Mammalian coat colouration is a complex trait with functional advantages for camouflage and physiology. This past year, **Dr Nandini Rajamani's** research group focused on investigating the coat colour and pattern variation of three palm squirrels species (*Funambulus* genus) which occur across much of the Indian subcontinent. Using the availability of museum skins, they studied coat colour evolution in an integrative framework of adaptation to multiple climatic conditions and camouflage from predators. Generalized additive models found that the distribution of colouration across geography paralleled actual species distributions. We found precipitation, vegetation and soil colour to be the significant drivers of colouration in the southern palm squirrel species. In contrast, the northern species seem to be mainly driven by vegetation. In addition, we find that stripes have evolved in response to avian and mammalian predator visual systems. A behavioural study of

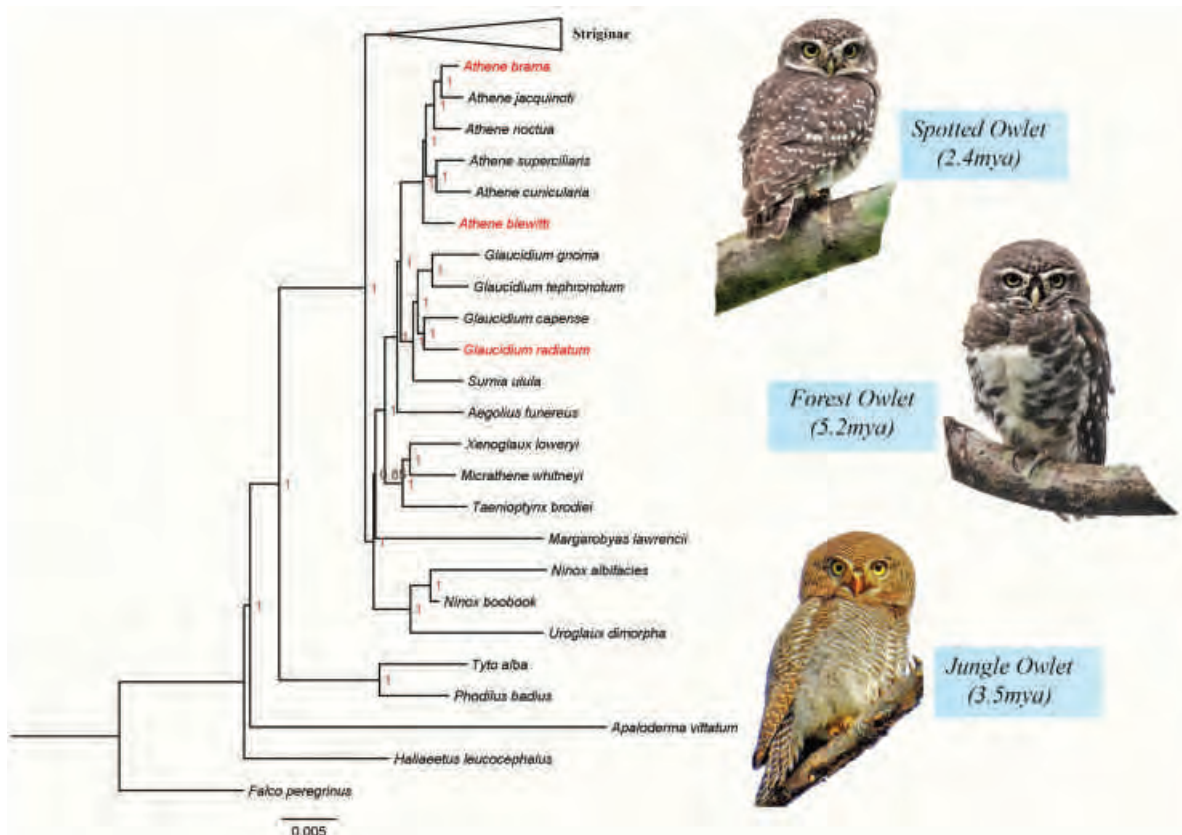


▲ Colour morph distribution of three species of palm squirrels across India.

one species of palm squirrel asked if squirrels modify their behaviour while on different surfaces to achieve maximum camouflage and escape from predators. The results indicated that squirrels engaged in different behaviours on different substrates and that overall, squirrels spent more time in highly camouflaged backgrounds.

In addition, the group is exploring genomic differences across species and has sequenced the whole genomes of palm squirrel species to investigate signals of selection and adaptation in pigmentation processes. They are also expanding this work to understand coat colour evolution in rodent species across the globe by using a combination of genomics and image analysis. Other significant efforts in the lab include the building of an extensive database of squirrels across India, using citizen science initiatives and public awareness. Towards this, the group has launched social media platforms (Squirrels of India on Instagram and Facebook) and is working on building a website.

One of the significant questions in studying biodiversity is understanding the taxonomic relationships of species. This provides insights into a species' evolutionary relationships and ecological requirements for its conservation. **Dr Robin VV's** research group studied the forest owl, an endangered, endemic bird. Based on morphometric data, osteological evidence and behaviour, the Forest Owllet has been placed in the genera *Heteroglaux*, *Athene* and even *Glaucidium* between 1873 to 2018. Even though a recent study placed the species under *Athene*, it showed inconsistencies between gene datasets. Ultraconserved elements are highly conserved regions of the genomes over millions of years and are shared across vertebrates. Dr Robin's group used thousands of UCE markers to construct a comprehensive phylogeny of owllets, including the Spotted Owllet and the Jungle Owllet. The resulting phylogenetic tree resolved the earlier discrepancies and places the Forest Owllet robustly in the genus *Athene*, while estimating the date of divergence for these owllets. The Forest Owllet is the early split among other *Athene*, which diverged about 5.2 million years.



▲ Phylogenetic tree of owllets.

India hosts four global biodiversity hotspots that harbour several threatened and small-ranged species. Given the nationwide protected area network, the research group asked how much India protects its threatened and small-ranged bird species. They used a more accurate 'area of habitat', calculated from the published distribution ranges, for 99 Indian birds and assessed the extent of protection they receive in the country.

Many birds use songs to communicate, which have a significant role in territorial defense and mate selection. We examined the song matching and song complexity in territory holding males of White-bellied Sholakili *Sholicola albiventris* in a Shola forest patch in the Palani hills, Western Ghats, India. We used n-gram models to study the complex song sequences of Sholakili and compared individual-level variations within and across seasons for three years of data.

2.0 CHEMICAL SCIENCES

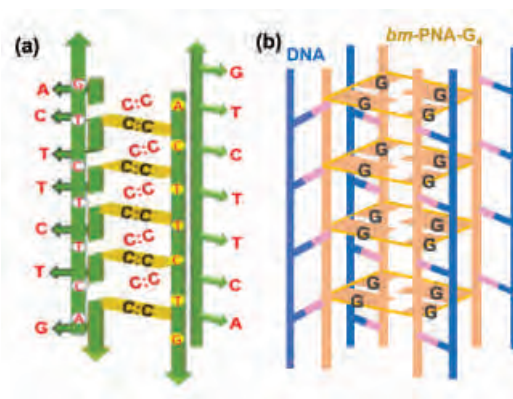
The Chemistry Department at IISER Tirupati strives towards instilling the spirit of enquiry among the young undergraduate and research students in emerging areas of modern chemistry research spanning organic, inorganic, organometallic, physical and materials chemistry. The department has globally competent faculty members exploring spectacular research advances not only in important themes of synthesis, structure and dynamics but unravelling subtle features of the chemistry-biology and chemistry-materials interface. They investigate complex relationships involving an amazing range of molecules, supramolecular systems and materials involving multiple length, time and energy scales. Many of these molecules and materials synthesized for the first time have immense potential, ranging from rapid diagnostic tools for nucleic acid sensing to the imaging of tissues/metabolites and new therapeutic agents to eliminate life-threatening diseases. The department also works with many industries like the Gas Authority of India Limited (GAIL) and Tata Steel to develop more efficient catalysts for organic transformations as well as new materials for recyclability and energy storage. This is linked to the circular economy concept for the future and is ably supported by a strong group in computational modelling and theoretical chemistry using machine learning and data analytics. Some of the specific details are described below:

2.1 Chemistry-Biology Interface

The main focus of **Dr Ashwani Sharma's** lab is to develop label free fluorescence-based RNA biosensor for disease detection and nucleic acid-based therapeutics. His group has developed RNA based sensor for miRNA detection that has been shown to work *in vitro* and plan to make the RNA sensor work in cells as it is genetically encodable. The lab is also developing RNA sensors that can detect dynamic levels of metabolites in cells, and the results are encouraging *in vitro*. In addition, Dr Sharma's lab is also trying to engineer single guide RNA (sgRNA) in CRISPR-Cas9 system for efficient genome editing and imaging. The lab is also working on the detection of thiols in cells using genetically encoded biosensor systems, and the initial results are encouraging *in vitro* and will be translated in cells.

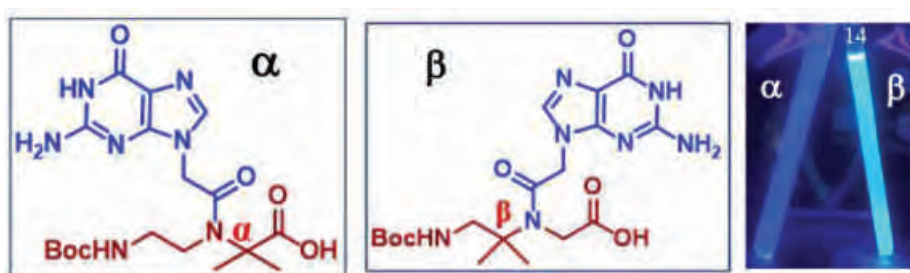
Work in **Prof Krishna N Ganesh's** group on the directed molecular assembly of bi-modal PNA to form duplexes, double duplexes and triplex of duplexes has now been extended to form i-Motifs, G4 tetraplex and derived tetraplexes. The bimodal PNAs carrying all C on either triazole or amide face form characteristic C-C+ interdigitated i-motifs at acidic pH ~4.0, while only duplexes at physiological pH 7.0. The tetra duplexes of i-

motif tetraplexes could not be generated as duplexes are unstable at acidic pH. This was overcome by assembling bimodal G4 tetraplexes that are stable at pH 7.0 in presence of K^+ . The stability of the of the molecular assembly tetraplexes at pH 4.0 and duplexes at pH 7.0 was obtained by temperature dependent UV absorbance studies.



bm-PNA tetraplexes (a) bm-PNA-C i-motif and (b) bm-PNA-G₄ tetraplex and its tetraduplex with complementary DNA

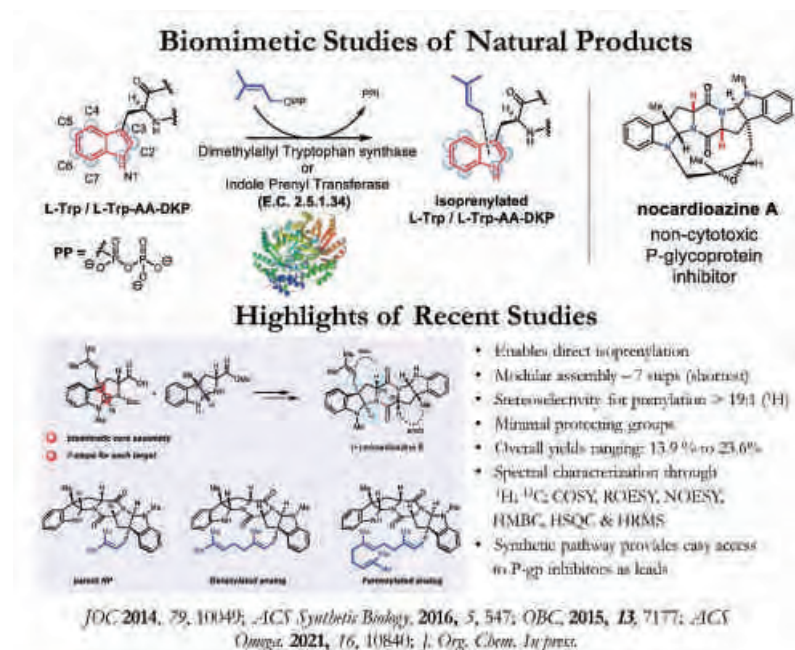
In another project in Prof Ganesh's lab, it was observed that the α/β -gem dimethyl PNA -T/C monomers exhibited fluorescence although they do not have conventional fluorochrome structures. This is in contrast to unsubstituted standard *aeg*-PNA monomers that are not fluorescent at all. The group has recently shown that the α -gem dimethyl substitution induces a Z-type rotamer, while β -gem dimethyl substitution imposes E-type rotamer. Further, the α -gem dimethyl *aeg*-PNA monomer shows bluish fluorescence while β -gem dimethyl *aeg*-PNA analogue shows greenish fluorescence, suggesting that the type of Z/E -rotamer influences the fluorescence properties. These compounds also exhibited fluorescence in the solid state. The origin of fluorescence in such non-fluorochrome compounds is interesting, and recent theoretical studies have indicated that the origin of fluorescence in these types of compounds termed “clusterogens” arises from extensive $n-\pi^*$ and $\sigma-\pi^*$ electronic transitions favoured by a mixture of backbone conformations in chains with flexible single bonds. It would be interesting to study if the inherent fluorescence properties of gem-dimethyl PNA monomers are retained in derived PNA oligomers and if so, they will have interesting biological and material applications.



α (Z-rotamer) and β (E-rotamer) - gem dimethyl PNA structures and the blue and green fluorescence associated with them

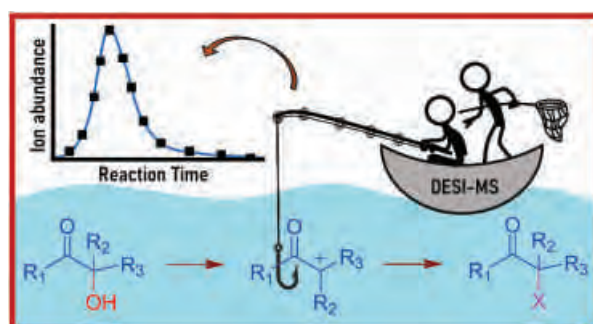
The overarching theme of **Dr Rajesh Viswanathan's** lab focuses on the biomimetic synthesis and biosynthesis of medicinally valuable natural products. The lab has recently developed biomimetic strategies to access terpene-indole-alkaloids. These tryptophan-derived compounds show antineoplastic effects, inhibition of P-gP mediated drug efflux, as well as anti-gametocytic activity against *malaria falciparum*, that causes malaria. The strategy allowed regioselective direct isoprenylation, benzylation and crotylations of cyclic-Trp-

containing diketopiperazines. Beyond the method that led them to prepare several C3-prenylated Trp-derived natural product derivatives, the lab was able to access nocardioazine alkaloids in merely 7 steps. Leads from this study are currently being tested as non-toxic, P-gp inhibitors. Dr Viswanathan's lab recently reported a biocatalytic pathway to access antiviral isonitriles that possess potential to act against MRSA [Methicillin Resistant *Staphylococcus aureus*]. Antiviral agents such as these isonitriles are in tremendous demand as the world faces severe challenges due to increasing antibiotic resistance. The Viswanathan group also designs peptidomimetic strategies to inhibit Spike protein: ACE2 interactions to develop protease inhibitors against SARS-CoV-2.



◀ Schematic representation of recent highlights from Dr. Viswanathan's group

Reactive intermediates are often elusive and rapidly annihilated in the reaction medium, prohibiting their direct observation by spectroscopic techniques. Dr Shibdas Banerjee's group has tamed water microdroplets to intercept such fleeting species (e.g., carbocations and carbanions) for their mass spectrometric detection. This was accomplished in real time of the reaction, allowing new insights into reaction mechanisms to be obtained. The group reported that electrohydrodynamically generated high-speed aqueous microdroplets could directly capture and stabilize transient carbocations and carbanions in the air-water interface, followed by their ejection to the gas phase. These gaseous species were subsequently transferred to a high-resolution mass spectrometer for their direct observation. This study created a new avenue for probing the intermediacy of several short-lived intermediate species, including the reactive α -carbonyl cations, which otherwise remained postulated in many reactions without any direct evidence. The group proposed a plausible



◀ The destabilized α -carbonyl cation has been isolated from the reaction medium and directly detected by mass spectrometry after more than 50 years of its proposal as a reactive intermediate.

mechanism demonstrating why such reactive species are stabilized in the air-water interface, although those are rapidly annihilated in the bulk water. This study lays the foundations to further explore the mysterious power of aqueous microdroplets in the future for stabilizing a wide variety of intermediate species.

Dr Soumit Sankar Mandal's group is studying Cren7, a crenarcheal DNA bending protein selected as a model system to understand the DNA bending phenomenon. Spectroscopic studies indicate that Cren7 preferentially associates with A-T rich DNA. Circular dichroism studies indicate that Cren7-DNA interaction lead to the supercoiling and bending of DNA. Binding of protein also induces a cooperative structural change in DNA. But such transitions were not observed in Cren7. Eukaryotic cells have compartments that carry out specific functions and help organize the intracellular matter. These compartments can either be membrane-bound or membrane-less. Membrane-less compartments are formed via liquid-liquid phase separation (LLPS) from surrounding cytoplasm or nucleoplasm and are often referred to as biomolecular condensates. These condensates carry out their designated tasks and remain functional only when they are in a liquid-like state. α -synuclein is a presynaptic protein that supervises neuronal survival and synaptic vesicle trafficking regulation. At early stages phase-separation of α -synuclein is reversible but eventually, there is loss of dynamics and aggregation. Additionally, factors including mutations and disease-relevant conditions accelerate α -synuclein LLPS and subsequent fibril formation. Using these systems, the lab aims to study the effect of molecular chaperones (Hsp40/Hsp70) in maintaining the liquid-like nature and prevention of aggregate formation.

2.2 Synthetic Chemistry

Dr Gopinath Purushothaman's research group is interested in the development of new synthetic methods using sustainable routes and their applications in the synthesis of drugs & natural product using catalysis as the main tool with particular emphasis on photoredox catalysis, transition metal catalysis and dual catalysis. Currently, one of the group's research focus is exploring the synthetic utility of aryl urea synthons for accessing diverse molecular scaffolds using photoredox catalysis. In this direction, the research group recently reported a substrate-controlled cascade addition-cyclization of o-alkenyl aryl ureas, an ambident nucleophile for constructing functionalized heterocycles such as 2-amino-1,3-benzoxazines and dihydroquinazolinones in a chemodivergent fashion using photoredox catalysis under mild conditions. The versatility of the method has been successfully demonstrated by applying this method for the synthesis of functionalized etifoxine drug derivative. Remote C-H functionalization is another challenging process as it is very difficult to selectively functionalize a remote C-H bond in the presence of other C-H bonds. In this direction, the group demonstrated remote meta selective C-H mono & di-olefination of mandelic acid derivatives in a controlled fashion using commercially available $\text{Pd}(\text{OAc})_2$ as the transition metal catalyst.

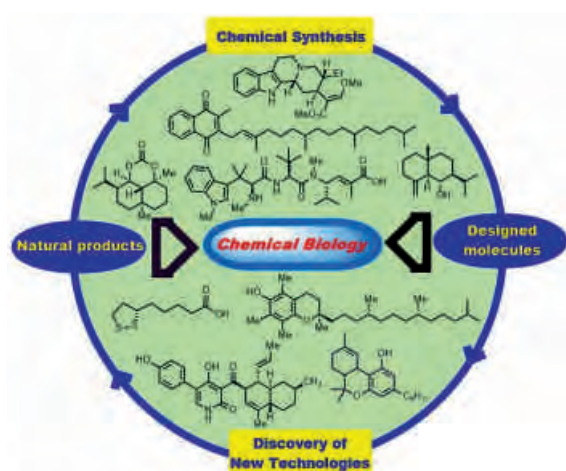
Dr Purushothaman's group is also interested in the use of sufoxonium ylides as a safe alternative for carbene precursors. Traditionally, diazo compounds are commonly used as carbene precursors, which are potentially explosive with limited substrate scope. Hence, new and alternative strategies to overcome these limitations



◀ Schematic representation of Dr Purushothaman's research

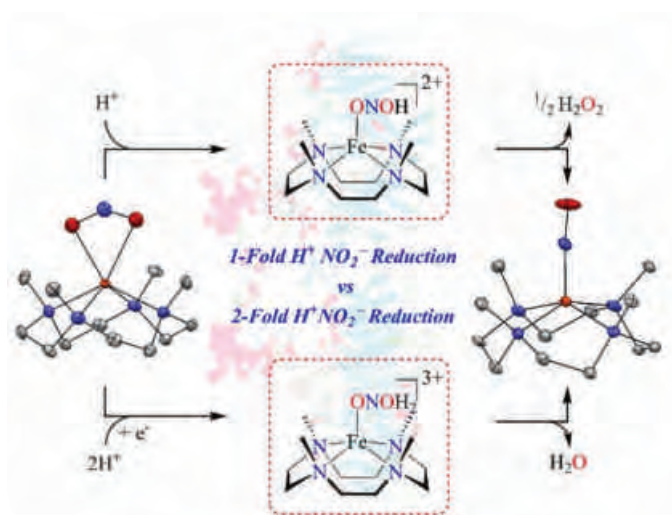
are highly desirable. In this direction, the group recently achieved hydrazine-directed, Rh(III) catalyzed (4+2) annulation of N-alkyl aryl hydrazines with sulfoxonium ylides. The reaction shows excellent functional group tolerance with broad substrate scope, scalability & site selectivity.

Natural products are an essential source for identifying new therapeutic targets and developing new therapeutic molecules and targets. Despite their clinical importance, a sudden decline in natural product research was observed in the recent times mainly due to their limited supply from natural sources. **Dr Kiran Kumar Pulikuri**'s group focuses on developing the scalable synthesis of natural products, which has high clinical significance. So far, the group has made significant progress in the synthesis of anti-cancer agent hemiasterlin and antibiotic arylomycine and completed the total synthesis of Junenol, dihydrojunenol, 10-epijunenol. In addition to the natural product research, the group has also made significant progress in the process development of nutraceuticals alpha-lipoic acid, vitamin E and K.



◀ Schematic representation of Dr Pulukuri's research

Dr Pankaj Kumar Koli's research focusses on biomimetic/bio-inorganic modeling and nitric oxide (NO) chemistry. Recently, the group explored/mimicked the biological nitrate reductase (NRs) followed by nitrite reduction via oxygen atom transfer reaction using V^{3+} in a Co-nitrate complex, explaining why nitrite or nitrate form in NO oxidation reactions. Further, they also explored how intermolecular NO transfers work in biological systems and in between two different metal complexes. The first-ever report shows intermediate formation prior to intermolecular NO-transfer, explaining how physical parameters and ligand frameworks

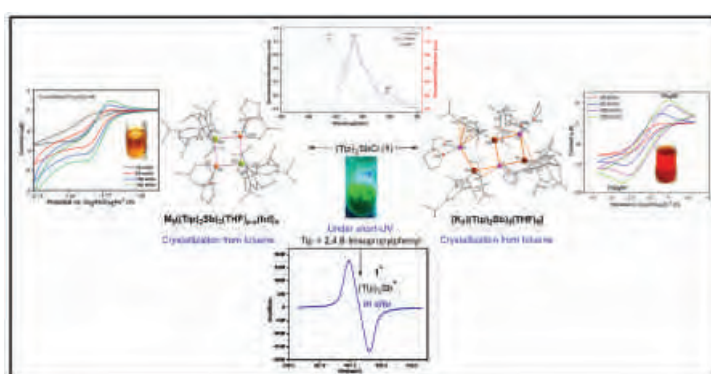


◀ NO activation and NO mono-oxygenation reaction

affect end product stabilities. Moreover, the group has also explored/mimicked Cu & Fe-based nitrite reductase reactivity. Biological studies show NiR reaction produces NO with H₂O as a side product; in these reports, the group shows how pH regulates the side product of NiR reaction (H₂O₂ and H₂O formation) (under revision). Additionally, they are working on mimicking nitric oxide dioxygenase (NOD) using a nonheme-iron nitrosyl complex.

Dr Sudipta Roy's research comprises of main group chemistry and computational studies on bonding and stability of halophosphasilynes.

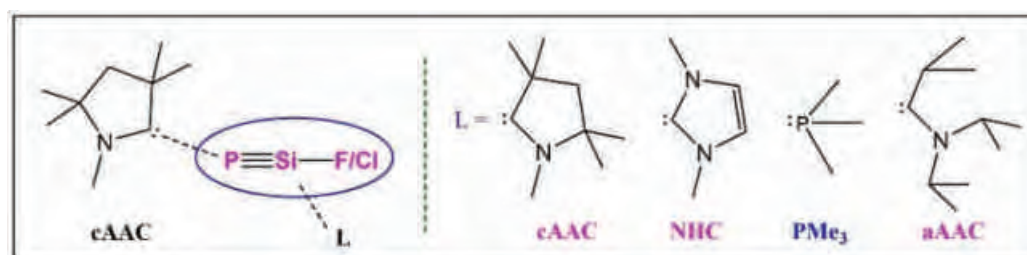
I. Main Group Chemistry: A rare class of redox active alkali metal-based trimeric/dimeric antimonides have been stabilized by Dr. Roy's group utilizing the novel fluorescent, easily accessible precursor, bis[2,4,6-triisopropylphenyl]antimonychloride by the reductive dehalogenation method. Cyclic voltammetry (CV) studies of the trimeric alkali metal phosphinidenide suggested its potential application as a main group-based reducing agent, which was further proved *via* the conversion of Tip-PCl₂ to trimeric (Tip)₃P₃, and cAAC)₂P₂.



◀ Syntheses and fluorescence properties of dimeric and trimeric alkali metal antimonides.

II. Computational studies:

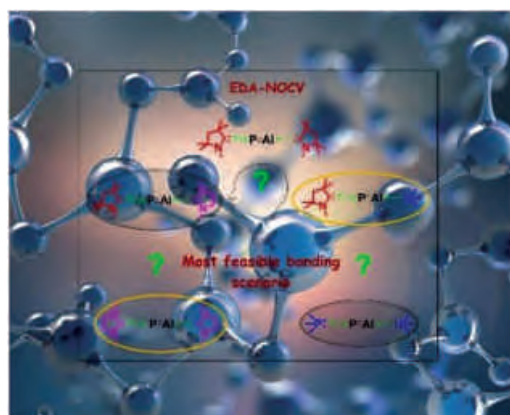
A. Bonding analysis: Dr Roy's group has studied the bonding and stability of the elusive halophosphasilynes, cAAC-PSi(Cl/F)-L (L= ligands) using DFT and EDA-NOCV analysis, indicating the synthetic viability of this class of compounds, stabilized in their singlet ground state, in the laboratory.



▲ Towards the syntheses of elusive chlorophosphasilynes: A theoretical approach.

B. The group has analyzed the suitability of the ligand fields to stabilize the not so far reported multiple bonded heterodiatomic group 13/15 compounds, and their respective bonding and electron densities distribution analysis have also been performed. The lab has shown the synthetic feasibility of the donor-base-stabilized monomeric AIP species of the general formula (L)P-Al(L'); [L = cAAC^{Me}, L' = cAAC^{Me}, NHC^{Me}, PMe₃, (NⁱPr₂)₂; L = L' = NHC^{Me}, PMe₃; cAAC = cyclic alkyl(amino) carbene; NHC = N-heterocyclic carbene]. Energy decomposition

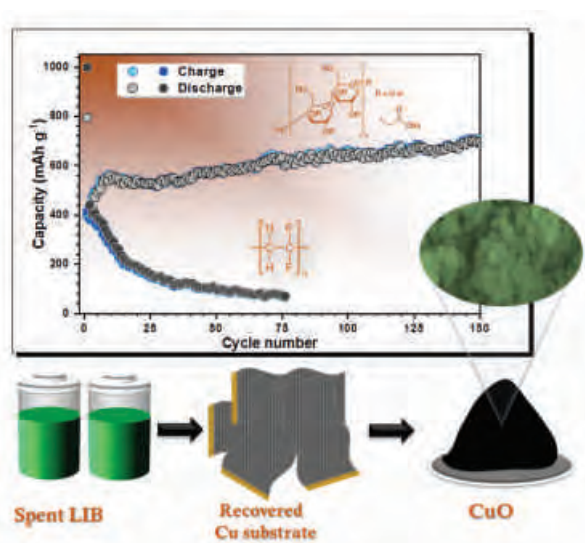
analysis coupled with natural orbitals for chemical valence (EDA-NOCV) analysis indicates the synthetic viability of this class of species, stabilized in their singlet ground state, in the laboratory.



Donor-base stabilization of reactive aluminium-phosphides.

2.3 Chemistry Materials interface

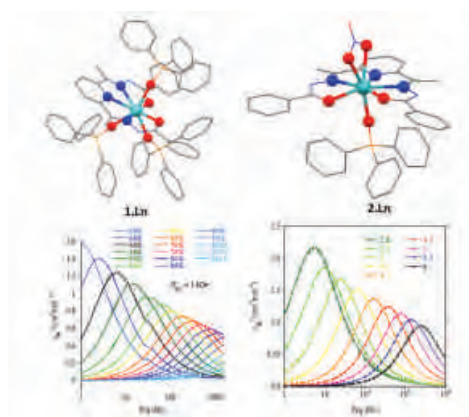
It is well established that the Al and Cu foils are the irreplaceable current collectors for commercial Li-ion batteries (LIBs) and have a great impact on their performance. The sustainability and cost of the current collectors are important factors in improving the circular economy of the battery technologies, and it can be achieved by the effective recycling of spent LIBs. Spent LIBs are a valuable resource with potential environmental hazards owing to the presence of a lot of metals and materials, urging researchers to recycle/reuse via effective technologies. In this line, **Dr Aravindan Vanchiappan's** group chose CuO as an anode for Li-ion capacitor (LIC) assembly by considering its high theoretical capacity (674 mAh g^{-1}), chemical stability, abundance, and low cost. The group used recovered Cu-foil for the conversion of CuO nanostructures and subsequently employed it as an anode. The commercial-grade activated carbon (AC) is used as the cathode in which faradaic reaction occurs in the former and non-faradaic reaction in the latter, i.e., AC. The conventional binder, polyvinylidene fluoride (PVDF) binder, has many demerits, such as low flexibility, harmful solvents like N-methyl-2-pyrrolidinone, swelling at raised temperature, unsaturated >C=CF- bonds, thus resulting in a risk of thermal runaway of the cell, etc. Also, the electrochemical performance of the CuO with PVDF binder was not much satisfying. Therefore, the group attempted to use the water-soluble carboxymethyl cellulose (CMC) binder, and the half-cell (Li/CuO) exhibited better electrochemical performance such that even after 150 charge-discharge cycles, i.e., the cells could retain a specific capacity of



Schematic representation of performance of conversion type CuO nanoparticles from spent Li-ion batteries towards facile Li-storage

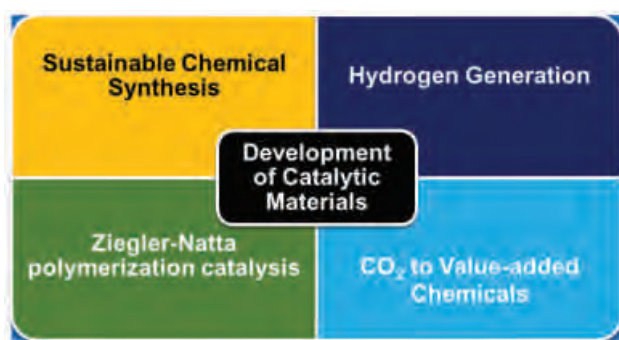
$\sim 680 \text{ mAh g}^{-1}$. Finally, the LIC was assembled with AC cathode and prelithiated CuO ($\text{Cu}^0 + \text{Li}_2\text{O}$) as anode with balanced mass loading and delivered a maximum energy density of 65.6 Wh kg^{-1} with excellent cyclic stability for 10,000 cycles with $\sim 80\%$ retention. The use of the passive component, Cu current collector, recovered from spent LIB into the anode (CuO) active material clearly boosts the goal of achieving a circular economy in the recycling of spent batteries.

The research group of **Dr Arun Kumar Bar** focusses on multi-pronged synthetic strategies for 3d/4f metal-based multi-functional molecular and supramolecular magnetic materials. Predesigned ligands are used to tune coordination geometry and crystal-field topology to tailor ionic magnetic anisotropy of the desired metal centres. Subtle change in synthetic strategy could lead to significantly structural variations. On the other hand, subtle change in structural variation could lead to prominent change in slow-magnetization relaxation. One can exploit such a delicate synthetic tools to tailor magnetic and photophysical properties. As an example, treatment of 2,6-diacetylpyridine bis-salicylhydrazone (DAPS) with hydrated $\text{Ln}(\text{OTf})_3$ salts (Ln stands for lanthanide) with 1:1 molar ratio in the presence of Et_3N as a base and triphenylphosphine oxide (TPPO) as co-ligand results in mononuclear octacoordinate complexes ($1\cdot\text{Ln}$). The same reaction with $\text{Ln}(\text{NO}_3)_3$ salts instead of $\text{Ln}(\text{OTf})_3$ salts renders octacoordinate complexes ($2\cdot\text{Ln}$). The slow magnetization relaxation investigation showed that the Dy analogue of the former series displays higher energy for magnetization reversal than the Dy analogue for the later series.



Comparisons of the single-crystal X-ray structural (top) and slow magnetization relaxations (bottom) of the Dy analogues of the series $1\cdot\text{Ln}$ (left) and $2\cdot\text{Ln}$ (right). In the structural representations H atoms from both and the counter anion from $1\cdot\text{Ln}$ are omitted for clarity. Color codes: cyan, Dy; orange, P; red, O; blue, N; grey, C.

Dr Ekambaram Balaraman's research primarily focuses on generating resources for green energy and recycling atmospheric waste. Specifically, the group works on the design and development of catalytic materials for hydrogen generation from feedstock chemicals, sustainable chemical synthesis, and conversion of CO_2 to value-added chemicals. The group is also interested in the development of new electron-donors for Ziegler-Natta olefin polymerization catalysis. Dr Balaraman and his research group have explored a novel

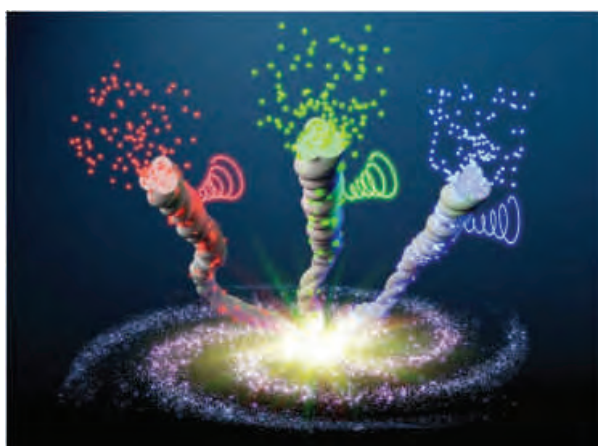


Schematic representation of Dr Balaraman's research

chemical bond activation process via metal-ligand cooperation. In this concept, ligand activates the substrate in cooperation with the metal center by undergoing reversible structural changes in the catalytic pathway and facilitates the product formation with minimal energy input, and operates under environmentally benign conditions.

Dr Janardan Kundu's group has been working on understanding of factors that control the broad band emission in low dimensional metal halide hybrids for lighting applications. The group has been able to successfully decipher correlation between metal halide site asymmetry and PL emission wavelength. Further, they have been able to draw correlation between the distortion of the metal halide unit and the PLQY in such structure. Dr Kundu's group has been successful in understanding electronic cross-talk between metal halide units in a zero D hybrid mediated by the interleaving water layer. This constitutes one of the first examples wherein electronic coupling in OD metal halide hybrids have been demonstrated. They have also showcased the first example of room temperature emissive Tellurium based OD metal halide hybrids. Further they are working on synthesizing multi metal centered OD halide hybrids for structure directing effects using doping methodology. All these research efforts are being devoted for development of broad band emitter materials.

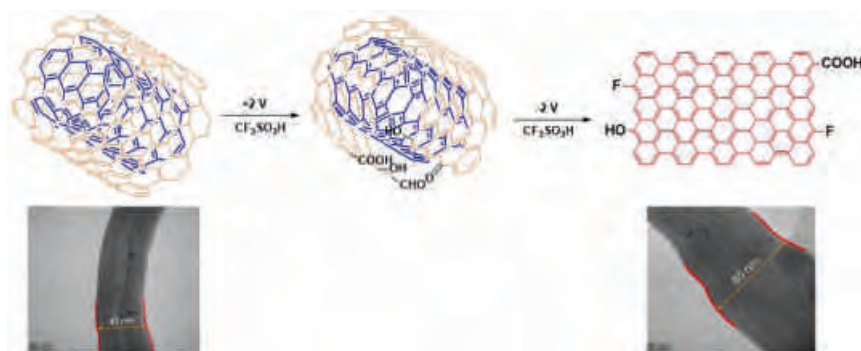
Dr Jatish Kumar's research group focusses on the design and synthesis of chiral hybrid nanomaterials. Different strategies adopted for the induction of optical activity in nanomaterials include, (i) synthesis of intrinsically chiral nanosystems, (ii) chirality induced through molecular interactions and (iii) template assisted chiral induction through host guest interactions. Among the different strategies host-guest approach has gained enormous attention in recent years due to its simplicity and applicability to a vast variety of systems. The interaction of achiral nanoparticles with chiral templates results in the generation of optical activity in the nanocomposites. Adopting a similar host-guest approach, multicolored achiral carbon nanodots could be encapsulated into a chiral gel formed from amphiphilic molecules. The gel constituted of elongated helical structures that could function as templates for the assembly of luminescent nanoparticles on its surface. The efficient chirality transfers from the host matrix to the guest nanoparticles resulted in multicolor chiral luminescence from these materials. Based on the nature of carbon nanodots embedded in the gel, red, green and blue circularly polarized luminescence could be generated from the nanohybrids. Considering the relevance of chiral light emitting materials, such nanocomposites can be potential candidates for application as anti-counterfeiting tags, biosensors and materials in light emitting devices.



◀ Scheme illustrating the generation of red, green and blue chiral luminescence from achiral carbon nanodots assembled on organic gel matrix composed of helical supramolecular aggregates.

Prof Vijayamohan Pillai's research group focuses on two dimensional materials like graphene, phosphorene as quantum dots and their heterostructures with special emphasis on their electrochemical applications. For example, they have recently carried out super acid-mediated Unzipping of Carbon Nanotubes at Room-temperature to Fluorinated Graphene Nanoribbons for energy storage applications, in

which, Multiwalled carbon nanotubes are transformed into graphene nanoribbons (GNRs) by an electrochemical approach in trifluoromethane sulfonic acid electrolyte. The proposed strategy essentially involves two steps; longitudinal unzipping of carbon nanotubes (oxidation) to produce oxygen functionalities at a constant potential and their subsequent reduction to form GNRs. The application of electric field at room temperature results in the unzipping of carbon nanotubes with concomitant functionalization. Potential applications of fluorinated GNRs(F-GNRs) include electrocatalysis, biosensing, optoelectronics, solar energy conversion, and energy storage. Similarly size-dependent and heteroatom doped graphene quantum dots for electrocatalytic applications like Oxygen Reduction Reaction and flexible 2D based composites for battery electrolytes are also being investigated.

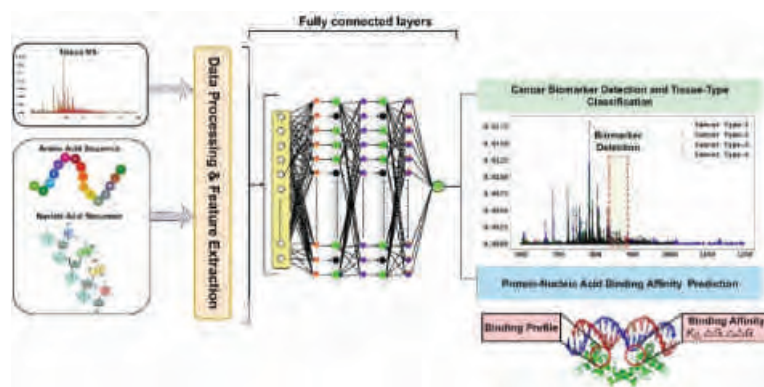


◀ Schematic representation of the two-step unzipping of MWCNTs into GNRs in Trifluoro-methane sulfonic acid at Room temperature generating fluorinated (30%) graphene nanoribbons for multifarious applications

2.4 Theoretical and Computational Chemistry

Dr Debasish Koner is working in the area of reaction dynamics, spectroscopy, and machine learning. Small molecular ions are present in significant amounts in the interstellar medium and planetary atmospheres. Formation and dissociation dynamics of those small molecules play crucial roles in exploring the evolution of the universe as well as the reactions occurring during the reentry of space vehicles or hypersonic flights. Computational ro-vibrational (infrared) spectroscopic studies of those small molecules result in the transition frequencies which are the characteristic feature of those molecules. The spectral lines help to detect a molecular species in the interstellar medium and exo-planetary atmospheres.

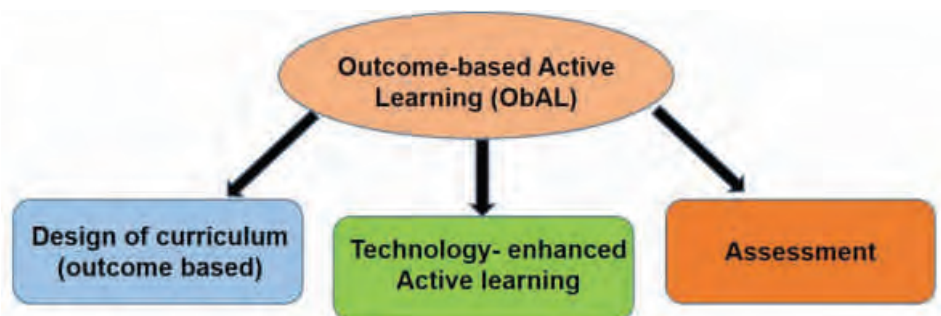
Machine learning (ML) techniques can be used to predict the outcome of chemical reactions and can also be used as a rapid diagnostic tool for various diseases by training the mass spectral data of tissue/blood samples. ML models can be constructed to predict the binding affinity of protein and DNA/RNA which will be a useful tool for understanding the regulatory systems of organisms. Understanding the heterogeneous nature of a medium from its structural features can be done via ML techniques.



◀ Schematic representation of Dr Koner's research

Rare Gas hydrides are abundant in interstellar medium. Recently $^{36}\text{ArH}^+$ has been detected in the Crab nebula. In a reaction dynamics and spectroscopic study, the collision between $^{36}\text{ArH}^+$ and Ar is explored via quantum and classical mechanical approaches as well as the transition frequencies for $^{36}\text{Ar}_2\text{H}^+$ are computed from quantum mechanical calculations. The group has also reviewed the dynamics of proton (H^+) exchange reactions between two rare gas atoms. The N_3 system has an important role in the collision dynamics of $\text{N}+\text{N}_2$ during the reentry of space vehicles into the earth's atmosphere. In two different studies, the group has investigated the collision dynamics of $\text{N}+\text{N}_2$ reaction and the photodissociation dynamics of N_3^+ . Distributions of the product states are predicted using a neural network model for gas phase atom-diatom reactions. In a collaborative work, an efficient ML model was developed for rapid diagnosis of breast cancer from mass spectral data of cancer and normal tissues and was used to sort out the most important biomarkers for breast cancer. The group has also developed an ML model to predict the binding affinity of protein and DNA/RNA complexes and working on extracting the most efficient features from structural information to distinguish different phases in heterogeneous mediums.

Dr Nirmala Krishnamurthy's research involves chemical education and the implementation of innovative pedagogical strategies in the classroom. The traditional teaching style is didactic and teacher-centered, adopting a lecturing approach in which the majority of learners participate passively. This turns the educator into a dispenser of knowledge and the student into a mostly passive recipient. This methodology provides the learner with knowledge or skills, or both, but they are not coupled to a specific context – so the learning takes place in an “intellectual vacuum”. Dr Krishnamurthy's research focusses on introducing innovative pedagogical methods and learning strategies in undergraduate classes/laboratories and generating positive outcomes in student's learning experiences and competencies. Dr Krishnamurthy's research employs a three pronged Outcome based Active Learning (ObAL) strategy. This involves designing learning outcomes, assessments that tie in to these outcomes and innovative pedagogical methods such as development of active learning strategies and creating flipped classroom courses. Overall, these diverse methodologies are crucial for the sustainable success of an educational institute to bring about a paradigm shift in its undergraduate education.



▲ Three-pronged approach of Outcome-based Active learning strategy

Dr Padmabati Mondal's group works on understanding photochemical and biochemical processes using multi-scale theoretical and computational methods.

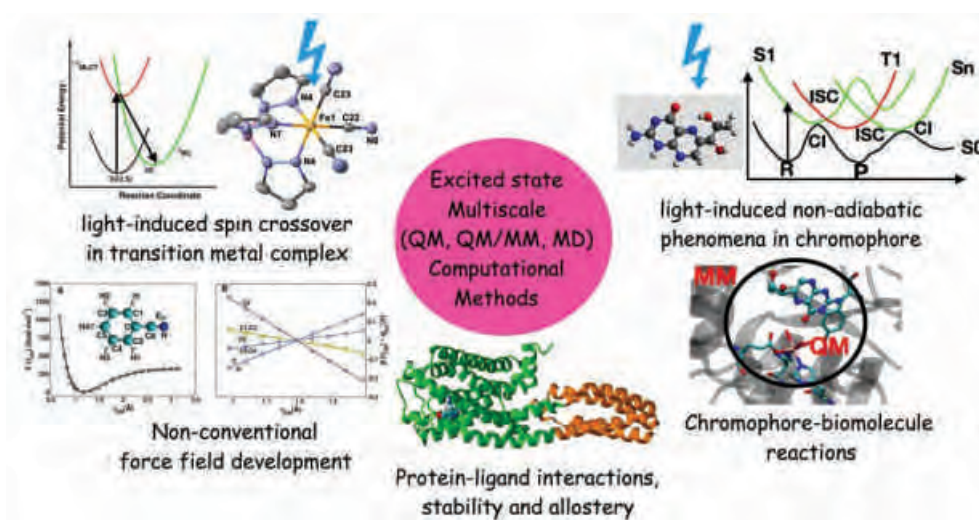
(I) Light-induced processes for the biologically important organic chromophore and organometallic complexes using quantum chemistry: How does a chromophore or organometallic complex changes its electronic structure and properties in the excited state? What are the effect of different electron-withdrawing and electron-donating substitutions on the spectroscopy and photochemistry of these molecules? What is the pathway and dynamics for the excited state decay for those chromophores? What are the role of subtle

quantum mechanical phenomena e.g. non-adiabatic coupling, spin-orbit coupling, conical intersection in the excited state dynamics? These are few key questions Dr Mondal's group is finding the answers using quantum chemical methods.

(II) Biomolecular simulation for protein-drug and protein-DNA interactions: What are the different important non-covalent interactions in the binding site? What are the important conformational changes in the protein due to binding which triggers the function of the drug molecules? How does the stability of DNA or protein changes due to binding? How does the thermodynamics and kinetics changes during binding? The group answers these question using combined techniques of quantum chemistry and molecular dynamics simulation.

(iii) Hybrid QM/MM simulation for active processes in biomolecules: To study the (photo)chemical processes in a particular site of a large bio molecules, the group uses multi scale simulation technique based on hybrid quantum mechanics and molecular mechanics where quantum chemical methods are applied in the active site and rest of the system is treated using molecular mechanics. In this way, both the details of the active process as well as crude effect of the large environment are taken care.

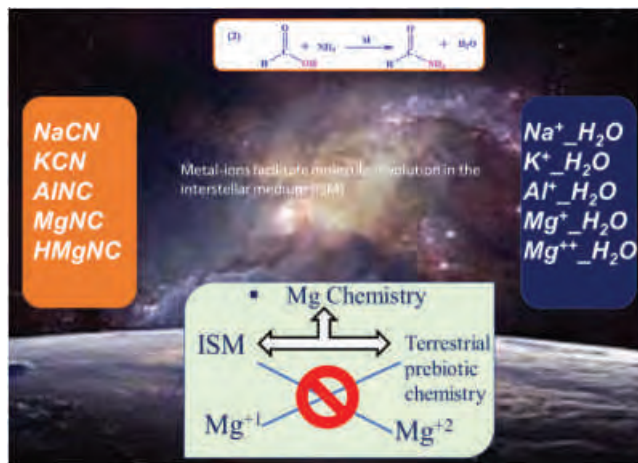
(iv) Ab-initio based molecular mechanical force fields development: Dr Mondal's group is also working on development of quantum-chemistry based non-conventional accurate molecular mechanical force fields for the application in spectroscopy.



▲ Schematic representation of Dr Mondal's research

As part of their work in the area of computational astrochemistry, **Dr Raghunath O Ramabhadran**'s group has highlighted the role of metal-ions in interstellar chemistry. For this purpose, they chose the problem of gas-phase formamide formation in interstellar molecular clouds. Formamide is a key biomonomer and contains the simplest peptide $[-(C=O)-NH-]$ linkage. With its two electronegative atoms ("O" and "N"), it provides an excellent platform to probe the role of the metal-ions. The metal-ions chosen were Na^+ , K^+ , Al^+ , Mg^+ , and Mg^{2+} —all of them present in the ISM. The metal-ions were studied in three different forms: as bare positively charged ions, as hydrated metal-ions co-ordinated with a molecule of water, and when the metal-ions are part of a neutral covalent molecule. With the aid of electronic structure calculations [CCSD(T) and DFT methods], the group studied different gas-phase pathways which resulted in the generation of interstellar formamide. They found that metal-ions lower the barriers (with Mg^+ , Mg^{++} , and Al^+ offering maximal stabilization of the transition states) and facilitate the reactions. The chemical factors influencing the reactions, the putative

conditions in the ISM, the astrochemical implications of the study, and its connection with terrestrial prebiotic chemistry and refractory astrochemistry were subsequently presented. Based on their results, the group also recommends the detection of two new closed-shell molecules, $\text{NH}_2\text{CH}_2\text{OH}$ (aminomethanol) and CH_2NH_2^+ (iminium ion), and two open-shell molecules, CONH_2 (carbamyl radical) and HCONH (an isomer of carbamyl radical), in the ISM.



◀ Schematic representation of Dr Ramabhadran's research

Dr Rakesh S Singh's group works on the following projects:

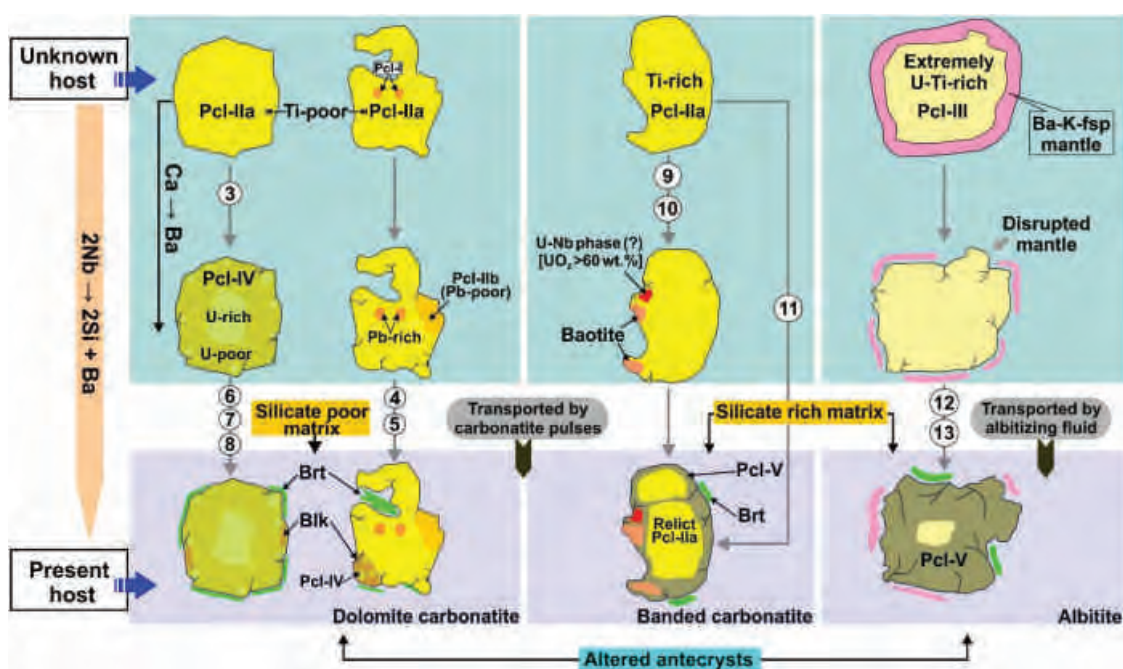
(a) structural origin of the thermodynamic anomalies in supercooled water: Liquid water is well-known for its unique thermodynamic anomalies in the supercooled state. Recently, two-state models have been employed extensively to provide an alternate framework to understand the anomalous behaviour of water, however, the major difficulty lies in the unambiguous specification of the two (distinct) local states of liquid water. In their ongoing study, the group has proposed a new method to unambiguously assign two-distinct local structures in liquid water. This method is based on the system's (heterogeneous) relaxation to the potential energy landscape during the energy minimization process. They also observed that the temperature dependent behaviour of the population fluctuation of the two distinct local structures of liquid water correlates strongly with the anomalous behaviour of the heat capacity at constant pressure.

(b) Microscopic pathway of low-density amorphous (LDA) to high-density amorphous (HDA) glass transition in water: Water forms two types of glasses (glass polymorphism) – LDA and HDA. However, the microscopic pathway(s) of LDA-HDA transition in water (unlike liquid-ice transition) is still illusive. The major difficulty lies in defining an order parameter that can distinguish the HDA and the LDA phases. Using the technique rooted in machine learning, the group has proposed a set of order parameters which distinguishes unambiguously the two glassy forms of water. They have also explored the microscopic pathways of glass transition and found that LDA-HDA transition is a first-order-like transition and follows non-classical pathway.

(c) Cavitation and Ice-nucleation from doubly metastable water: Using classical density functional theory (DFT), Dr Singh's group has explored the cavitation and ice-nucleation from the double metastable water where water is metastable with respect to both the vapor and the ice phases. They observed an anomalous non-monotonic temperature dependence of the vapor nucleation rate on isochoric cooling and attribute this anomalous dependence to the existence of the temperature of maximum density in liquid water.

The department of Earth and Climate Sciences offers a science-based program designed to prepare students for a range of challenging careers in the broad fields of geological and climate sciences. The department offers courses spanning different sub-areas of geology, geophysics and climate science, which lead to a better understanding of fundamental earth processes and help to solve problems arising from natural hazards such as earthquakes, volcanic eruptions, severe storms, and global climate change, demand for new sources of earth materials, and many others. Research done by our faculty and students focuses on a wide variety of earth systems to increase the understanding of how our planet works. The department offers research opportunities on crystallography and mineralogy, petrological processes, global climate change and many more.

Dr Aniket Chakrabarty's research group studies the petrogenesis, geodynamical significance and economic potential of exotic alkali- and carbonate-rich (alkaline rocks) rocks derived from the Earth's mantle (carbonatites, nepheline syenites, etc.). These rocks are one of the most fascinating things created by nature because they consist of minerals one would not find in common rocks (such as granites) and also because they contain concentrated occurrences of many industrially important elements, including neodymium, niobium and many other critical metals.



▲ *Composition and genesis of albitite-hosted antecrystic pyrochlore from the Sevattur carbonatite complex, India. Mineralogical Magazine, 85: 588 – 606, in press.*

The main research focus of Dr Aniket Chakrabarty's group is on the mineralogy, geochemistry, and genesis of alkaline rocks. The group exclusively works on the Nb-mineralizations associated with Indian and Canadian carbonatites. They observed certain discrepancies in the nomenclature recommended by the International Mineralogical Association (IMA) and Commission on New Minerals Nomenclature and Classification (CNMNC) for the pyrochlore group minerals and suggest substantial revisions. To rationalise the classification scheme, they have started a multidisciplinary approach with International collaborations (Canada, US, and Germany) and recently published work on the zero-valent-dominant pyrochlores using the site total charge (STC) method. The study results suggest calculating a unique end-member formula for different species of the pyrochlore supergroup.

The research group is also working on the various aspects of U-REE-mineralization in Indian alkaline complexes. The main aim is to discover, locate and extract critical metal resources for sustainable exploration. To accomplish this goal, they are characterising fluid-rock interactions, considered the most effective way of metal transportation and subsequent deposition under suitable physicochemical conditions.



▲ Deep convective clouds before the occurrence of heavy rainfall event on 11th November 2021 over Yerpedu, IISER Tirupati Permanent campus. Installed instruments, i.e., Automatic weather station, Rain Gauge, SoilVUE10, Net Radiometer, Parsivel Disdroemter are shown.

Dr K Saikranthi's research group works on characterizing precipitation systems using remote sensing techniques both from in-situ and space-borne platforms and also associated atmospheric conditions. In the past year, a number of meteorological instruments including a ceilometer, automatic weather station with a rain gauge, soil moisture and soil temperature probes, net radiometer, and disdrometer have been installed at IISER Tirupati, and measurements have been collected from the pre-monsoon season, 2021. Along with the in-situ measurements, fifth generation European reanalysis dataset (ERA5) data are also used to understand the synoptic features associated with the precipitation systems over the region. The rainfall received during the 2021 northeast monsoon was 973 mm, which was more than the climatological mean rainfall (658 mm) plus its standard deviation (252 mm). However, November contributed an amount of 658 mm, which was also more than the climatological mean November rainfall (322 mm) plus its standard deviation (215 mm). Two successive heavy rainfall events occurred between 10-12 & 17-19 November 2021. The rain gauge at IISER Tirupati recorded an amount of 149.2 mm during the first spell and 234.2 mm during the second spell. The depressions formed over the Bay of Bengal propagated toward the Tirupati region, which were responsible for the heavy rainfall. The synoptic features responsible for the propagation of the depression were studied using the atmospheric parameters like vertical integral of moisture flux, relative humidity and geopotential height etc. The impact of the heavy rainfall event on the climate variables were investigated. Further, it was seen that

the e-folding time of decay for the surface soil dryness was more during heavy rainfall events than during normal rainfall events. The soil heat flux was reduced considerably during the two events because of the decrease in soil temperature.

Dr Utpal Saikia's research focus is to seismically image the Earth internal structure from the Earth crust to the deeper mantle. Using seismic images, his group is attempting to understand how the physical properties of Earth relate to tectonics of the region. As a whole, they are interested in understanding the evolution history of the continent and plate dynamics of the ocean. The group was mainly involved in two different areas of research during 2021-2022. The first research direction was aimed at understanding seismic attenuation at the equatorial Mid-Atlantic Ridge. The ocean lithosphere represents a simple realisation of the tectonic plate, offering a unique opportunity to better understand its physical and chemical properties in relationship to those of the underlying asthenosphere. While seismic velocity is frequently used to image the plate, seismic attenuation (Q_p^{-1}) offers an important complimentary observation. We use fundamental mode Rayleigh waves from 17 local, $M > 4.2$ earthquakes recorded at stations located on 0 – 80 My old lithosphere near the equatorial Mid-Atlantic Ridge. We determine the attenuation coefficient (γ) for periods between 15 and 40 s and invert for 1 – D average shear wave quality factor values (Q_p) and shear wave velocity (V_s).

The second research direction involves studying the earthquake source parameter beneath the Idukki region, Kerala. We estimated the source parameters for eight earthquakes beneath the Idukki region. The Idukki region is located in the south-central part of Kerala and forms part of the eastern border of the state with Tamil Nadu. The region under study falls under zone III, indicating moderate seismicity and is reported to have witnessed several small to moderate intensity earthquakes. We use local earthquakes whose magnitude varies between 2 and 3.5 and all the earthquakes are recorded by broadband seismometer. We mainly estimate the four important parameters from earthquake signals that provide an overall idea about the source i.e. seismic moment, stress drop, corner frequency and source radius.



MATHEMATICS

Faculty members of the Department of mathematics at IISER Tirupati are mainly engaged in abstract mathematical research. Research at IISER Tirupati is conducted in areas such as algebraic geometry, complex geometry, differential geometry, differential topology, Galois representation, harmonic analysis, number theory and representation theory of p-adic groups. The members of the department of mathematics are continuing their research activities in a focused manner.

Sup-norm bounds for automorphic forms is a fundamental problem in number theory, which is closely related to Lindelof hypothesis, and Riemann hypothesis. The main focus of **Dr Anilatmaja Aryasomayajula's** research is estimates of automorphic forms.

Dr Aryasomayajula's group has worked on estimates of cusp forms associated to certain cocompact arithmetic groups. Together with Dr Baskar Balasubramanyam (IISER Pune, India), they have derived the strongest published estimates of Hecke eigen cusp forms associated to certain cocompact arithmetic groups. With Prof Jurg Kramer (Humboldt University of Berlin, Germany) and Dr Anna von Pippich (University of Konstanz, Germany), they have derived estimates of Jacobi forms associated to the full modular group, which are polynomial in both index and weight. This is a significant improvement from the existing estimates which are exponential in weight.

A conjecture of Kimura asserts that the flow of vortex pairs on a Riemann surface is a geodesic on the Riemann surface. Together with a group of physicists and symplectic geometers led by J. Koiller, have proved the conjecture for all Riemann surfaces. For the case of hyperbolic Riemann surfaces, we computed estimates of certain automorphic functions using theory of heat kernels, which have helped Jair et al., to extend their proof to the case of hyperbolic Riemann surfaces.

Witt groups are defined for any triangulated category with duality and in this framework are studied via cohomological methods. For a scheme X by taking the bounded derived category of complexes of sheaves of A -modules on X having constructible cohomology **Dr Girja Shanker Tripathi's** group got constructible Witt groups of X . This has been recently studied by Jon Woolf in topology to understand signatures of manifolds. Dr Tripathi's group is exploring the constructible Witt groups for algebraic interpretation of signature as well as its applications to algebraic number theory.

Dr Tripathi is also studying representability of equivariant algebraic K-theory in the equivariant motivic homotopy category via Grassmannians and applications of this result in understanding some cohomology operations in the equivariant algebraic K-theory.

Let $M_{n+1}(c)$ denote the $(n + 1)$ -dimensional complete simply-connected Riemannian manifold of constant sectional curvature c . Thus, $M_{n+1} = S_{n+1}(c)$ if $c > 0$; $M_{n+1} = R_{n+1}$ if $c = 0$ and $M_{n+1} = H_{n+1}(c)$ if $c < 0$. Assume that $n \geq 4$ and let M be a complete connected embedded orientable hypersurface of constant isotropic curvature C in $M_{n+1}(c)$. Thus $R(p)(e_i, e_k, e_i, e_k) + R(p)(e_i, e_l, e_i, e_l) + R(p)(e_j, e_k, e_j, e_k) + R(p)(e_j, e_l, e_j, e_l) - 2R(p)(e_i, e_j, e_k, e_l) = C$ for every orthonormal 4-frame (e_i, e_j, e_k, e_l) in $T_p M$ and $p \in M$. Here $R(p)$ denotes the Riemann curvature tensor of M at p . In an ongoing work **Dr Gururaja HA's** group are trying to classify all such hypersurfaces explicitly. As of now, they have observed that M must have utmost two distinct principal curvatures at each point, and that M must have constant sectional curvature as soon as $n \geq 5$.

Dr Lakshmi Lavanya's group have obtained a generalization of the Fourier transform on the Heisenberg group. This transform satisfies many properties similar to that of the group Fourier transform. Few classical results which are true for the group Fourier transform also extend to this generalized Fourier transform on the Heisenberg group.

In collaboration with Dr Umesh Dubey (Harish-Chandra Research Institute, India), **Prof D S Nagaraj's** group is trying to understand the derived Category of moduli spaces. They are also working on understanding various properties of derived category of Elliptic surfaces which were classified by Kodaira in a series of papers during 1960's.

In another collaboration with Dr Fatima Laytimi (University of Lille, France) Prof Nagaraj's group is trying to understand various properties of vector bundles on projective varieties. Also, in yet another joint work with Dr Al Mazoni (Université d'Artois at Lens, France), they are trying to formulate vanishing sets of holomorphic vector fields on projective three space.

Dr Shalini Bhattacharya is working on the theory of Galois representations and modular form. More specifically Dr Bhattacharya's group is working to compute the mod p reduction of p -adic local Galois representations arising in several contexts. She is also interested in computing the Serre weights attached to a mod p representation.

Dr Souradeep Majumder has been working on various problems in algebraic Geometry. Specifically, his group deals with stacky curves in positive characteristic and focusses on studying the behaviour of stacky curves which are not tame. Dr Majumder's group is undertaking this study in collaboration with Dr Manish Kumar (Indian Statistical Institute, India).

In another study, Dr Majumder is continuing his investigation of parabolic bundles in positive characteristic. He is trying to construct the corresponding moduli space, as well as the moduli stack using GIT techniques. An alternate approach involving Falting's method is also being investigated.

Dr Subhash B has been studying the complex Milnor manifold. Recall that, for $r \geq s$, the complex Milnor manifold $H_{r,s}$ is a complex hypersurface in $CP^r \times CP^s$ given by the equation $\sum x_i y_i = 0$, where x_i and y_i are homogeneous coordinates in CP^r and CP^s , respectively. Along with Dr Ajay Thakur (IIT Kanpur, India), Dr Subhash's group have computed the KO^{-i} -groups of complex Milnor manifold $H_{r,s}$. Note that $H_{r,0}$ is the complex projective space CP^{r-1} . The K-groups of the complex projective space had been studied by J. F. Adams in [1] and KO -groups of the complex projective space had been studied by M. Fujii in [2]. They extend those results and give a complete description of K-ring of $H_{r,s}$ and use it to describe the generators for the KO^{-i} -groups of $H_{r,s}$ in terms of the pull back of canonical bundles over CP^s and CP^r .

Along with his student Ms Ambika, Dr Subhash has been studying sphere bundles, to understand the char rank of vector bundles over these spaces. They are also interested in understanding the almost complex structures on some manifolds that arise as sphere bundles.

Along with Mr Geory C Luke, he has been studying the topological quandles. A quandle X is a set with a binary operation $\triangle$ on X which satisfies the following conditions.

- (1) $x \triangle x = x \forall x \in X$
- (2) The map $\beta_y : X \rightarrow X$ defined by $\beta_y(x) = x \triangle y$ for every $y \in X$ is invertible.
- (3) $(x \triangle y) \triangle z = (x \triangle z) \triangle (y \triangle z)$

See [3] for more details. A topological quandle X is a topological space with a quandle structure such that the mapping

$$\triangle : (x, y) \in X \times X \rightarrow x \triangle y \in X$$

is continuous and β_y is a homeomorphism for every $y \in X$ [3]. Dr Subhash's group have established a homology and cohomology theory for topological quandles in the lines of a similar theory for quandles and given some applications. They are also trying to give a quandle structure on the topological K-groups and understand its applications.

Dr Venketasubramanian C G works on the representation theory of p-adic groups and branching problems of representations of p-adic groups. He worked on understanding the structure of the twisted Jacquet modules of representations of linear reductive groups defined over p-adic and finite fields.

In a joint ongoing work with his PhD student Mr Sanjeev Kumar Pandey, he is working on determining the structure of the twisted Jacquet module of a parabolically induced representation from the Levi subgroup of the Siegel parabolic of the symplectic group with respect to the standard non-degenerate character of the unipotent radical of the Siegel parabolic subgroup. In this case, the twisted Jacquet module has been determined and found to have a nice structure. Computing the structure of the twisted Jacquet module poses additional difficulty when the character of the unipotent radical under consideration is either not standard or if it is degenerate.

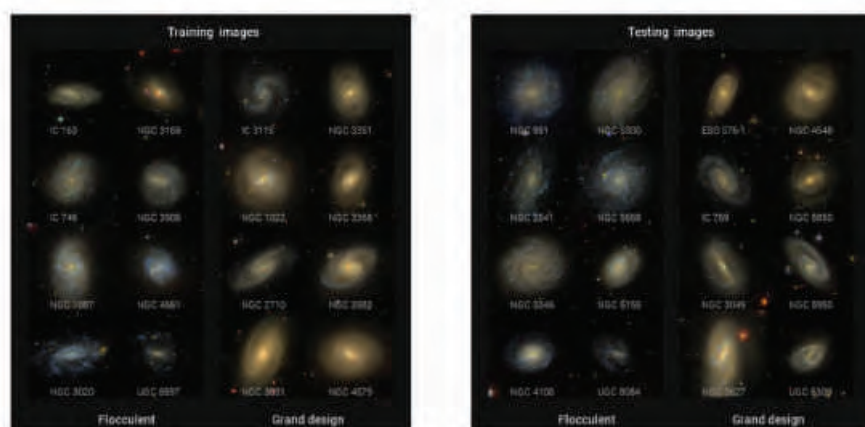
5.0 Physical Sciences

The research in Department of Physics at IISER Tirupati is currently centered around a few thrust areas such as astrophysics, experimental high energy physics, complex systems, theoretical condensed matter physics, soft and active matter, lasers and opto-electronics, atomic and molecular physics and active biological systems.

5.1 Astrophysics and Galactic Dynamics

a. Identification of Grand-design and Flocculent Spirals from SDSS using Convolutional Neural Network

Spiral galaxies can be classified into Grand-designs and Flocculents, based on the nature of their spiral arms. Grand-designs exhibit almost continuous, high contrast spiral arms and are believed to be driven by density waves; while Flocculents, on the other hand, have patchy or discontinuous spiral features and are mostly stochastic in origin. **Dr Arunima Banerjee** and her group constructed a convolutional neural network (CNN) model that classifies spirals into Grand-designs and Flocculents, with a testing accuracy of 97.2%. They then used the above model for classifying 1,220 new spirals from the SDSS (Sloan Digital Sky Survey). Out of these, 721 were identified as Flocculents, and the rest were being Grand-designs. Their work indicates that Grand-designs are mostly ordinary high surface brightness galaxies like our Milky Way, while Flocculents are intermediate-mass low surface brightness galaxies.



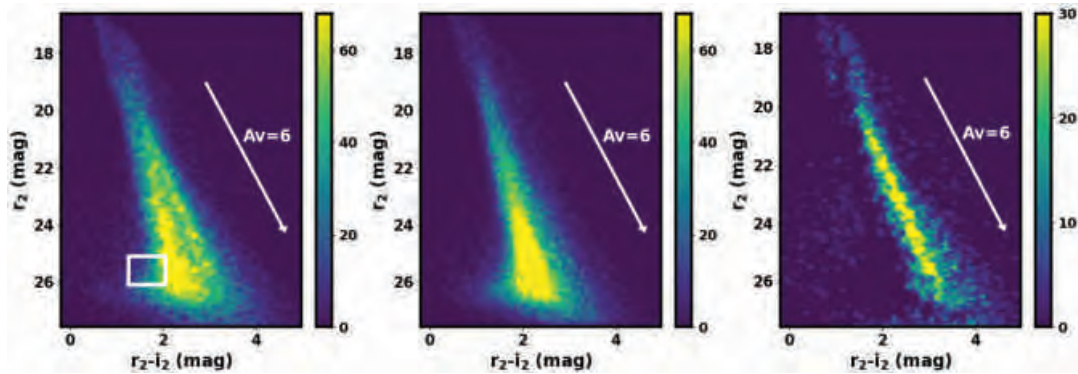
◀ Collage of flocculent and grand-design galaxies newly classified from the Sloan Digital Sky Survey (SDSS). (Sarkar, Narayanan, Banerjee & Prakash 2022 [arXiv:2205.08733])

b. Star formation under extreme environments

Low-mass star formation inside massive clusters is crucial to understand the effect of cluster environment on processes like circumstellar disc evolution, planet, and brown dwarf formation. The young massive association of Cygnus OB2, with a strong feedback from massive stars, is an ideal target to study the effect of extreme environmental conditions on its extensive low-mass population. Deep multiwavelength studies are essential to understand the role of stellar feedback on the IMF, brown dwarf fraction and circumstellar disc properties in the region.

Dr Jessy Jose and her research group obtained the deepest and widest optical photometry of 1.5° diameter region centred at Cygnus OB2 in r_z , i_z , z , and Y-filters, using Subaru Hyper Suprime-Cam (HSC). This work presents the data reduction, source catalogue generation, data quality checks, and preliminary results about the pre-main sequence sources. They obtained 7,13,529 sources in total, with detection down to $\sim 28, 27, 25.5$,

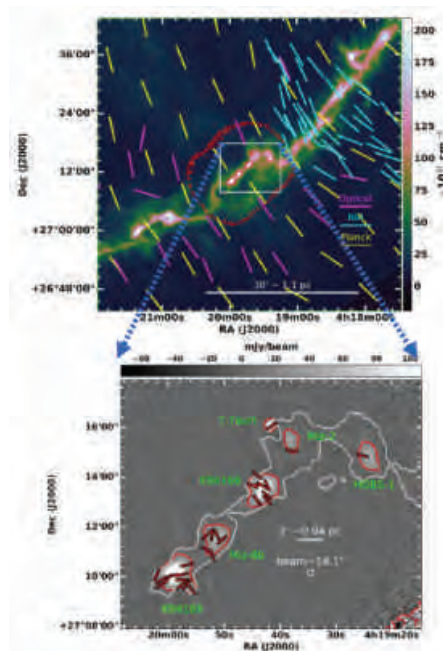
and 24.5 mag in r_2 , i_2 , z , and Y-band, respectively, which is $\sim 3 - 5$ mag deeper than the existing Pan-STARRS and GTC/OSIRIS photometry. They confirm the presence of a distinct pre-main sequence branch by statistical field subtraction of the central 18 arcmin region. They find the median age of the region as $\sim 5 \pm 2$ Million year with an average disc fraction of ~ 9 percent. At this age, combined with $A_V \sim 6-8$ mag, they detect sources down to a mass range of $\sim 0.01-0.17 M_\odot$. The deep HSC catalogue will serve as the groundwork for further studies on this prominent active young cluster.



▲ Hess plots of r_2-i_2 versus r_2 color-magnitude diagram for (Left) the Cygnus OB2 cluster field, (Middle) the control field and (Right) the field subtracted sources. The prominent pre-main sequence branch remains after the field subtraction. The white arrow marks the direction of reddening vector for $A_V = 6$ mag. This is the deepest optical photometry ever obtained for the region.

c. Interstellar medium (ISM) and magnetic fields

The group led by **Dr Eswarajah Chakali** aims at understanding the role of magnetic fields in the formation and evolution of cold and dense molecular clouds, and their eventual transformation into baby stars. Their group uses multi-wavelength dust polarization data to probe the magnetic field structure at various scales and densities of the molecular clouds. As part of a large collaborative program called “*B-field in Star Forming Region Observations (BISTRO)*”, they probed the magnetic fields in the faint dense cores which are the progenitors of forming Sun-like stars using James Maxwell Clerk Telescope (JCMT) and its polarimeter called SCUBA-2/POL-2. Their sensitive sub-millimeter polarization observations data at 850 micron wavelength revealed complex



▲ (Top panel): Large-scale (> 1 pc) uniform magnetic field structure that is piercing perpendicular to the filamentary structure of Taurus B213, one of the nearest low-mass star forming molecular cloud. Segments with different colors correspond to the position angles of magnetic fields from different wavelengths. (Bottom panel): Complex, core-scale (< 0.2 pc) magnetic fields (red segments) in the dense cores of B213 region as revealed by JCMT SCUBA-2/POL-2.

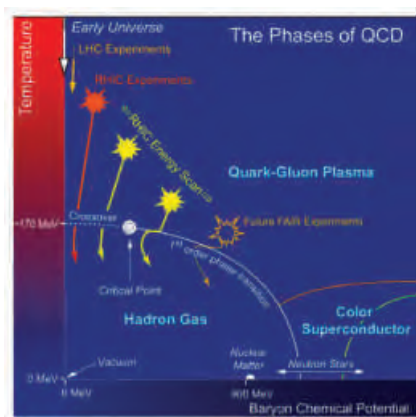
magnetic field structures in the cores of B213 at < 0.2 parsec (pc) scales. Although the parental cloud complex is threaded by a uniform large scale (> 1 pc) magnetic fields, which that has not been inherited down to small scales but rather modified by the gas kinematics at those scales. These results are in contrary to the expected uniform, coherent magnetic fields across the scales and densities encompassing clouds and cores.

Dr Eswaraiah's group also works on the understanding of polarization properties of interstellar dust grains based on the analyses of newly available distance information, polarization, and extinction values.

5.2 Experimental High Energy Physics

Dr Chitrasen Jena's research group focuses on the production of identified hadrons, resonances, and light nuclei to understand the properties of Quantum Chromodynamics (QCD) matter and explore the QCD phase diagram as shown in Fig. 5.2.1 using the data from the STAR experiment at RHIC.

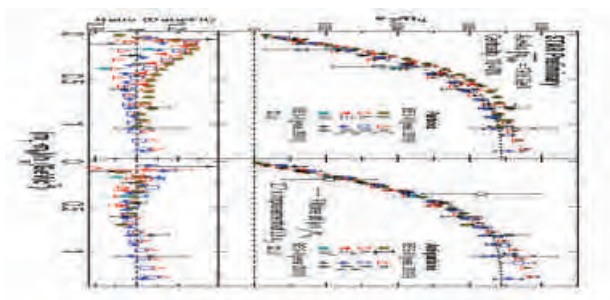
The Beam Energy Scan (BES) program is being pursued at RHIC to study the QCD phase diagram, to search for a possible QCD critical point, and to search for threshold energies for the Quark-Gluon Plasma (QGP) formation. The second phase of the beam energy scan (BES-II) at RHIC was completed in 2021 with high statistics datasets and several detector upgrades. This new data will help with precision measurements of multiple physics observables to understand the QCD phase structure.



◀ A conjectured QCD phase diagram with boundaries that define various states of QCD matter.

Elliptic flow of identified hadrons in Au+Au collisions

One of the important signatures of QGP formation is the measurement of elliptic flow, given by the second harmonic parameter (v_2) of the Fourier expansion of the azimuthal angle (ϕ) distribution of produced particles with respect to the reaction plane angle (Ψ_R), of identified hadrons. The observation of number-of-constituent quark (NCQ) scaling of v_2 for the identified hadrons is used to conclude the formation of a deconfined system at



◀ The NCQ-scaled elliptic flow of particles (left panel) and antiparticles (right panel) for 10-40% centrality in Au+Au collisions at $\sqrt{s_{NN}} = 19.6$ GeV.

top RHIC energies. Figure 5.2.2 shows NCQ-scaled elliptic flow, v_2/n_q versus $(m_T - m_0)/n_q$, for particles (left panel) and antiparticles (right panel) for 10-40% centrality in Au+Au collisions at $\sqrt{s_{NN}} = 19.6$ GeV using BES-II data. Dr. Jena and his group observed that the NCQ scaling holds better for antiparticles than for particles. This could be interpreted as the dominance of transported quarks at lower energies.

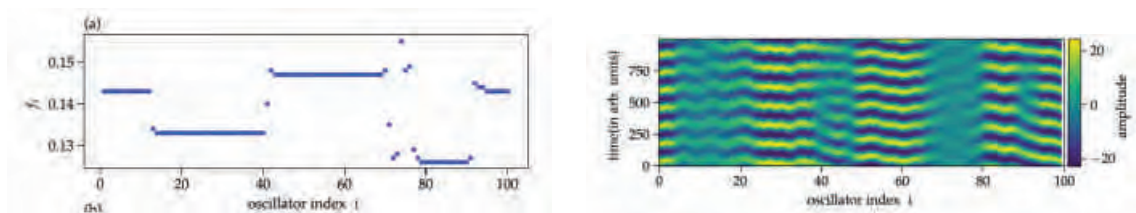
5.3 Complex systems

Prof G Ambika and her group try to understand the dynamics of complex systems from the collective behaviour of subunits using the framework of complex networks.

During 2021-22, they reported a novel type of frequency chimera, that occurs in interacting systems with differing time scales, tipping or sudden dynamical transitions on multiplex networks and emergence of spatio-temporal patterns on neuronal networks.

a. Chimeras on networks

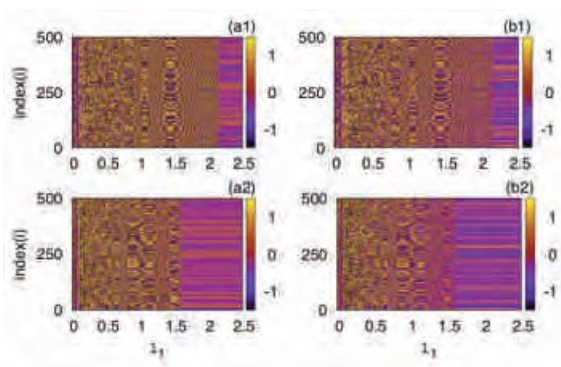
Chimera states are complex spatio-temporal patterns that consist of coexisting domains of coherent and incoherent dynamics, occurring in coupled systems. Prof Ambika and her group studied the emergence of frequency chimera, where coherence and incoherence are with respect to the emergent frequency of the oscillations. The study leads to a better understanding of such patterns observed in real-world systems like neuronal systems, power grids, social and ecological networks, where differing dynamical timescales is natural and realistic among the interacting systems.



▲ Frequency chimera state for 100 locally coupled Rossler systems.

b. Tipping induced by multiplexing in complex networks

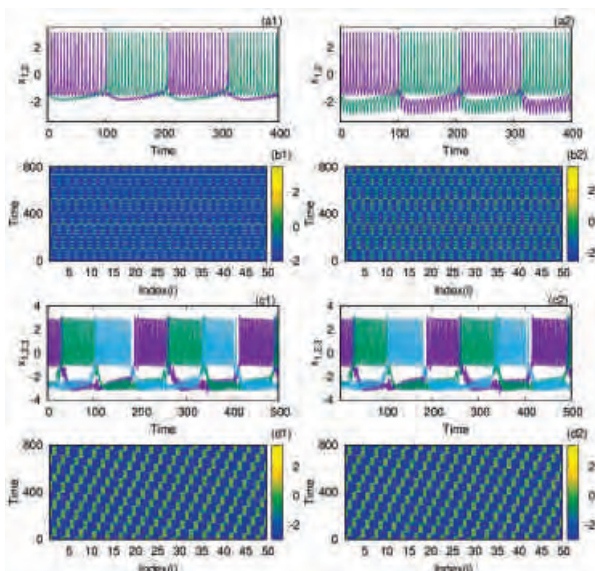
Multiplex networks are useful to study dynamics of systems with two type of interactions in highly complex systems. Along with PDRF, Dr Umesh K Verma, Prof Ambika studied how tipping or sudden transitions occur in one layer due to multiplexing with another layer due to indirect coupling with a shared environment.



◀ Transitions from oscillatory state to inhomogeneous steady state with increasing intra-layer coupling strength.

c. Spatio temporal patterns on multiplex neuronal networks

Prof G Ambika and Dr Umesh K Verma, studied how a variety of spatio-temporal patterns are generated among neurons when connected in a multiplex framework of two layers, with neurons of one layer coupled with excitatory synaptic coupling and neurons of the other layer coupled with inhibitory synaptic coupling. With the Hindmarsh-Rose model for the dynamics of single neurons, they analyzed the transfer or selection of interesting patterns of collective behavior between the layers.



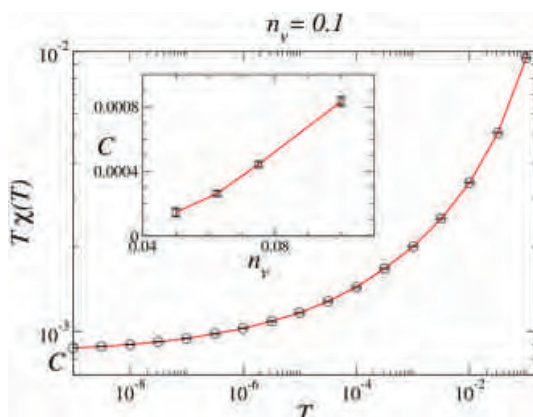
Transfer of dynamical patterns from layer 2 to layer1, in the 2-layer multiplex network.

5.4 Theoretical Condensed Matter physics

a. Strongly correlated quantum matter

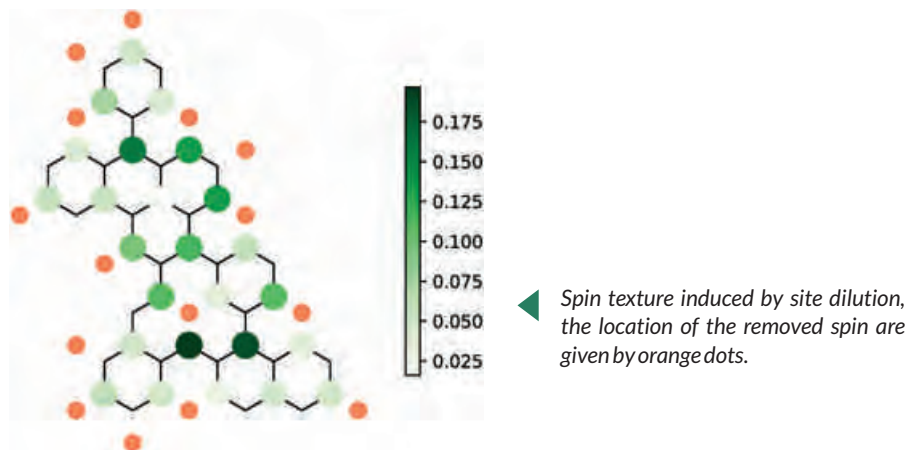
The research group of **Dr Sambuddha Sanyal** focuses on understanding emergent phenomena in strongly correlated quantum matter. In the year 2021-22 the important results from the Sanyal's group are as below:

a) Random-singlets are quantum spin liquid-like phases in spin systems where two spins at arbitrary distances can be entangled at low energy. Recent works suggest formation of emergent disorder-induced local moments at an intermediate energy; which ultimately freeze into a random singlet state at rather lower energies. Sanyal's group performs an asymptotically exact calculation to demonstrate such emergent moments and random singlet phenomenology on an SU(2)-invariant version of Kitaev's integrable model of a honeycomb-lattice spin liquid.



Susceptibility vs Temperature for the site diluted SU(2) spin liquid, Inset is the dependence of Curie term on dilution density.

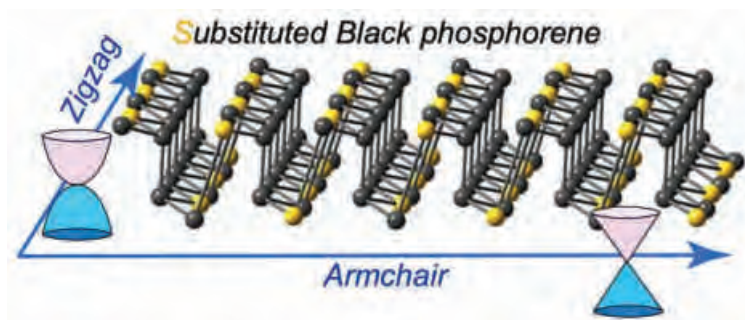
Using arbitrary precision numerics and analytical calculations to span the full range of low temperatures, they study the effects of vacancies (dilution by nonmagnetic impurities) and bond (exchange) disorder on the susceptibility. Their results may hold in the presence of some experimentally relevant perturbations to the model that we studied, thus this may lead to unexplored variants of cooperative physics of the low energy emergent degrees of freedom in a disordered quantum magnet.



b. Quantum Theory of Nanomaterials

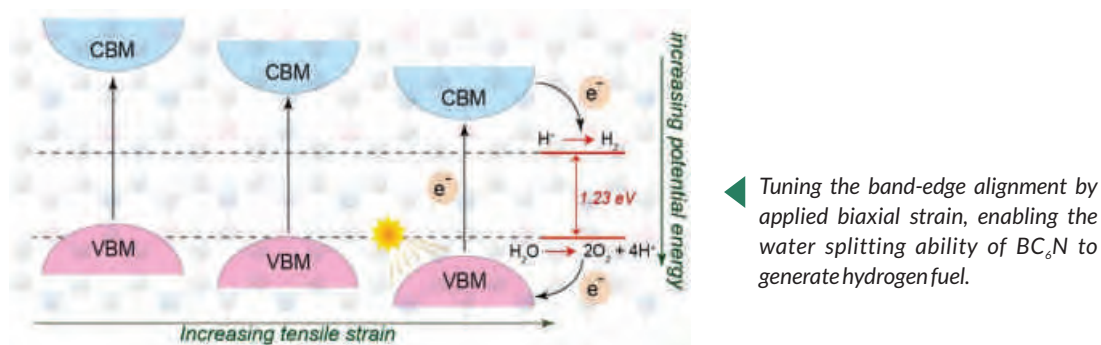
Nanomaterials provide an ideal playground to tune their exotic electronic properties to achieve unprecedented functionalities. Discovery of graphene has given a tremendous impetus in this field by allowing the understanding of behavior of electrons that are confined in truly two-dimension. However, continued search for novel and unique functionalities have given a plethora of other two-dimensional materials in recent times. **Dr Sudipta Dutta's** group is exploring the electronic, magnetic, optical and transport properties of such systems within various theoretical frameworks.

Dr Dutta and his research group has shown how elemental substitutions by Si and S induce holes and electrons, respectively to shift the Fermi energy and align that with the dispersive bands that results in metallic behavior. The S substitution shifts the Fermi energy upwards and aligns the same with the Dirac dispersion along the crystallographic armchair direction. Consequently, the substituted black phosphorene with SP_3 stoichiometry is expected to exhibit barrier-less Klein tunnelling along this crystallographic direction. However, the transport along the zigzag crystallographic direction can get suppressed by impurity scatterings. This anisotropic tunnelling behavior can be exploited for multi-terminal switching devices and memristor synapse applications.



Sulphur substituted black phosphorene shows anisotropic Klein tunnelling.

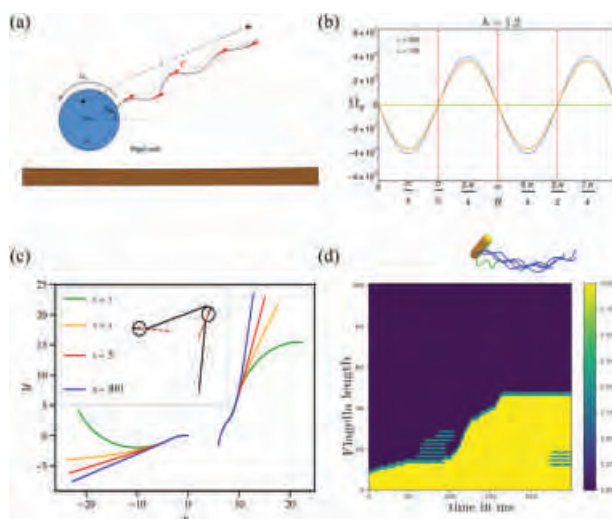
Photocatalysis is considered to be an effective step towards sustainability with huge implications in green energy production and pollutant degradation. Contributing to the global search for appropriate photocatalyst with commercially viable efficiency, Dr Dutta's group explores photocatalytic ability of BC_6N , a 2D metal-free direct band-gap semiconductor, in terms of its opto-electronic properties and optimal band alignment. The research in this group reveals BC_6N as a good reducing material with pronounced visible absorption, ensuring high photon harvest under solar irradiance. This can have potential applications in hydrogen fuel production or carbon dioxide sequestration through photo-electrocatalysis and reductive deposition of heavy metal ion for pollution control. To induce oxidizing ability, its band-edge alignment has been tuned by applying biaxial strain. They observe with expansion BC_6N becomes capable of performing both oxidation and reduction simultaneously. This fact broadens the applicability of BC_6N towards oxidative decomposition of organic pollutants, bacterial disintegration, and hydrogen generation from spontaneous water splitting etc. These results validate BC_6N to be a potential candidate as green photocatalyst.



5.5 Soft and Active matter and Microfluidics

a. Dense suspensions of flagellated bacteria

Dr Tapan C Adhyapak and his group derived the complex hydrodynamic interactions among flagellated bacteria in a dense suspension. The deformation of the flagellar bundle in a crowded environment has been captured by introducing a non-axisymmetric active particle model. The finite size of the cell body of each bacterium is incorporated by considering the reflected hydrodynamic image fields off the cell wall, and the coupling of the dynamics with the deformable flagella is captured by using the method of slender body theory. Complex analytical calculations and numerical integrations then reveal rich dynamics, including, a surprising bound state of an interacting pair and an efficient escape from obstacles.



b. Flagellated bacteria under confinement

The role of hydrodynamic interactions in the self-propulsion of flagellated bacteria bounded by walls is still remains mostly unknown. Extending a generic minimal model of a flagellated bacteria to incorporate a helical flagellar bundle in the vicinity of a substrate, Dr Adhyapa's group showed that hydrodynamic interaction between the cell body and the flagellar bundle is essential to explain experimental observations near a substrate Figure (a)-(b).

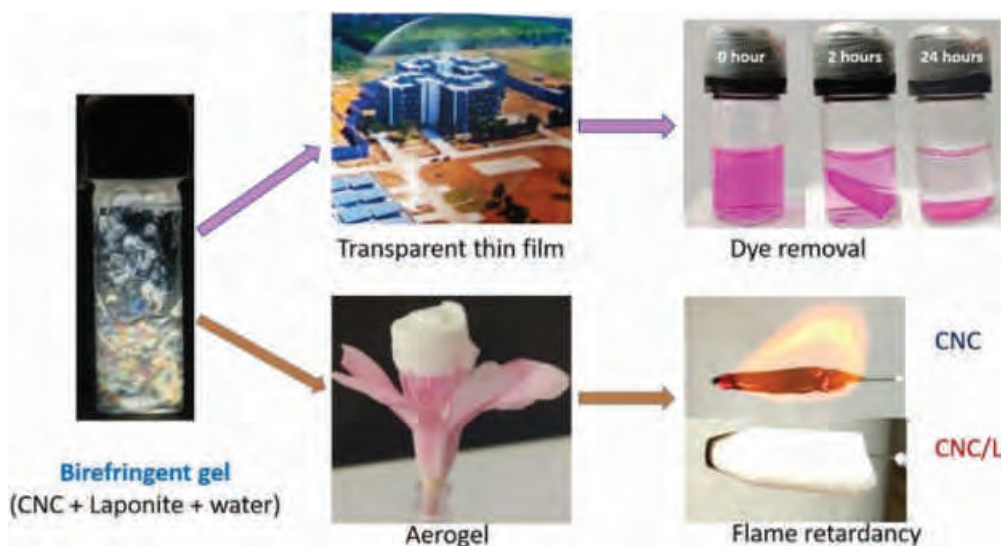
c. Polymorphic transitions of *E. coli* flagella during tumbling

In collaboration with Prof Holger Stark's group at TU Berlin, Germany, Dr Adhyapak's group also studies the role of flagellar polymorphic transitions during a tumbling event of an *E. coli* in quiescent and shear flows. Their preliminary observations show that the growth of a polymorphic form of a reverse rotated flagellum during a tumbling event, is greatly affected by mechanical stresses generated due to the reactionary cell body motions.

d. Soft and active matter-experimental studies

Dr Ravi Kumar Pujala's group is interested in soft and active matter field, the main focus being studying the physics of passive and active matter systems. The particular focus is on the fabrication of advanced functional materials with colloids, artificial microswimmers, liquid crystals, nanocomposites with biomolecules, biopolymers and carbohydrates. Their group identifies various means to create functional materials, one of them is self-assembly.

Their group recently demonstrated the fabrication of nanocomposite thin films and aerogels from the binary colloidal mixtures of cellulose nanocrystals (CNC) and Laponite (L). The thin films can be used as efficient absorbers of model pollutants such as Nile blue and Rhodamine B dyes in solution, while as-obtained aerogels display enhanced flame retardation behaviour. Further, they studied the pair interaction of charged silica nano and microrods in chiral nematic liquid crystals and showed that the microrods with homeotropic surface anchoring form a bound state due to the competing effect of electrostatic (Coulomb) and elastic interactions.

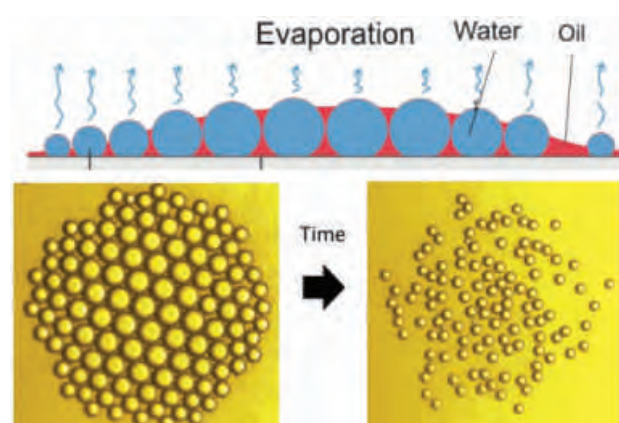


▲ Functional thin films and aerogels prepared from CNC/L aqueous birefringent gels.

e. Microfluidics

Dr Dileep Mampallil and his group concentrates on research that involves droplet microfluidics, and generate microdroplets in oil medium. They use these droplets to study single cells and bacteria, with an application to mimic aerosol droplets that contain pathogens.

Aerosols and microdroplets are known to act as carriers for pathogens or vessels for chemical reactions. The natural occurrence of evaporation of these droplets has implications for the viability of pathogens or chemical processes. For example, it is important to understand how pathogens survive extreme physiochemical conditions such as confinement and osmotic stress induced by evaporation of aerosol droplets. Previously, larger evaporating droplets were proposed as model systems as the processes in the tiny aerosol droplets are difficult to image. In this context, Dr Mampallil's group propose the concept of evaporation of capillary-clustered aqueous microdroplets dispersed in a thin oil layer. The configuration produces spatially segregated evaporation rates. It allows comparing the consequences of evaporation and its rate for processes occurring in droplets. As a proof of concept, they studied the consequences of evaporation and its rate using *Escherichia coli* (*E. coli*) and *Bacillus subtilis* as model organisms. Their study showed that the rate of evaporation of microdroplets is an important parameter in deciding the viability of contained microorganisms. With slow evaporation, *E. coli* could mitigate the osmotic stress by K⁺ ion uptake. Their method may also be applicable to other evaporating droplet systems, for example, microdroplet chemistry to understand the implications of evaporation rates.

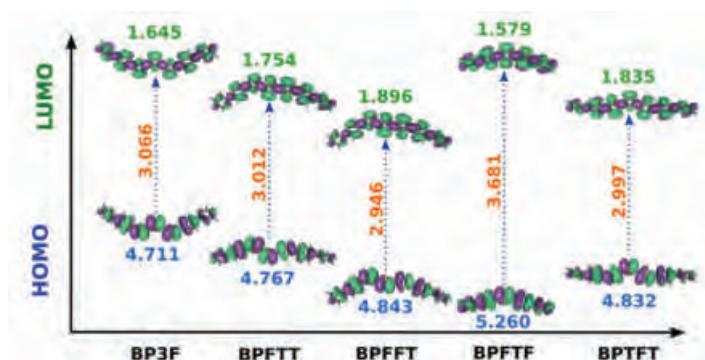


◀ Schematic representation of emulsion evaporation (top). Images of microdroplet cluster is also shown (bottom). Each single microdroplets are below 100 micrometers in diameter.

5.6 Opto-electronics

a. Theoretical analysis on the impact of furan substitution in biphenyl/thiophene system

Biphenyl/thiophene systems are known for their ambipolar behavior and good optical emissivity. However, often these systems alone are not enough to fabricate the commercial-grade light-emitting devices. In particular, our past experimental and theoretical analyses on the three-ring-constituting thiophenes end capped with biphenyl have shown good electrical properties but lack of good optical properties. From a materials science perspective, one way to improve the properties is to modify their structure and integrate it with additional moieties. In recent years, furan moieties have proven to be a potential substitution for thiophene to improve the organic semiconductive materials properties. In **Dr Kanagsekaran's** lab, his group systematically substituted different proportions of furan rings in the biphenyl/thiophene core and studied their optoelectronic properties, aiming toward organic light-emitting transistor applications.

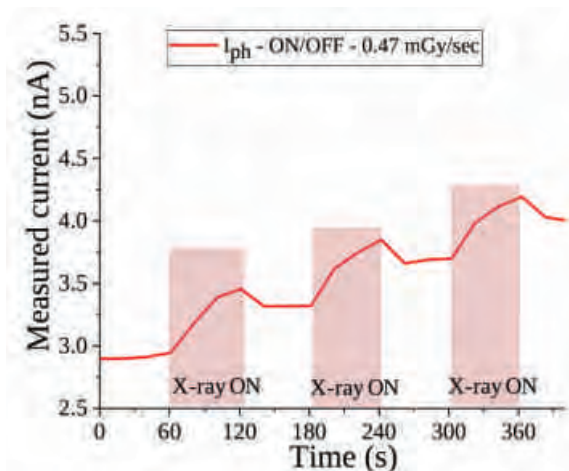


Calculated frontier molecular orbitals and energy gap of the systems for a suitable ambipolar light emitting transistor application.

They found that the molecular planarity plays a vital role on the optoelectronic properties of the system. The lower electronegativity of the “O” atom offers better optical properties in the furan-substituted systems. Further, the furan substitution significantly affects the molecular planarity, which in turn affects the system mobility. As a result, they observed drastic changes in the optoelectronic properties of two furan-substituted systems. Interestingly, addition of furan has reduced the electron mobility by one- fold compared to the pristine thiophene-based derivative. Such a variation is interpreted to be due to the low average electronic coupling in furan systems. Overall, systems with all furan and one ring of furan in the center end capped with thiophene have shown better optoelectronic properties. This molecular architecture favors more planarity in the system with good electrical properties and transition dipole moments, which would both play a vital role in the construction of an organic light-emitting transistor.

b. Pentacene based X-ray detectors

In collaboration with IIT Tirupati, **Dr Kanagasekaran's** group developed a pentacene based prototype for x-ray detection. Pentacene is well-known organic semiconductor and has been utilized for variety of electronic operation in the past. But due to their complex processing techniques, it was hard to realize x-ray detector with this material. In this lab, direct x-ray detectors using thermally evaporated pentacene thin-films are fabricated in Schottky and coplanar configurations and are analysed for low x-ray dose rates. In both configurations, the x-ray induced photocurrent is found to be five orders of magnitude greater than the theoretically evaluated threshold value that may reflect possible internal gain mechanism. Coplanar detectors showed unstable x-ray photocurrent characteristics; on the other hand, Schottky photodiode structure showed stable response and thus allowed to proceed for x-ray sensitivity measurements. Pentacene-based Schottky detector presented a decent volume sensitivity of $162.3 \mu\text{C}/\text{mGy}/\text{cm}^3$. The high x-ray sensitivity of pentacene Schottky detector



Dynamic response of the pentacene coplanar detector at the x-ray dose rate of 0.47 mGy/sec at 5 V. (For details, Ref. V. Lakshmi Vineela et al., 2022 JINST 17 P02024).

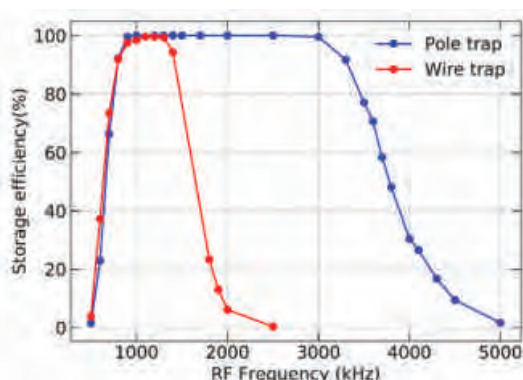
can be due to the complete depletion of the thin-film at the operating reverse bias, revealed by transfer characteristics of fabricated pentacene MESFET. Such a reasonably good x-ray photo conversion in low-Z _organic semiconducting materials uncovers the possibility of implementing them in x-ray medical dosimetry applications and in wearable electronic technology.

5.7 Atomic and Molecular Physics with Ion Traps

Dr Sunil Kumar's lab aims at developing a state-of-the-art ion-trap instrument at IISER Tirupati, which would allow performing a variety of experiments involving the interaction of photons with biomolecules, such as absolute photo-detachment and photo-dissociation cross-section measurements. The preliminary setup is now complete, which houses a prototype of a wire ion trap that will be implemented soon. The prototrap setup has been tested for its efficient trapping characteristics. The next phase is to replace the prototrap with the wire trap (under construction) that allows large optical access to the trapped ions. Once the installation of the wire trap is complete, they will carry out their first experiments on the measurement of absolute photo-detachment cross-sections of biomolecular ions of interest. These will be the first such measurements in the literature which together with complementary quantum chemical calculations will allow casting light on the photophysics of biomolecular ions. Meanwhile, the group is also developing a fluorescence spectroscopy setup by incorporating a cavity-based fluorescence measurement with the ion trap setup. These measurements will dramatically enhance the capabilities of the ion trap setup in exploring the photophysics of biomolecules. In addition to the development of the ion trap setup, their group is characterizing the wire ion trap using numerical simulations in comparison with conventional ion traps.



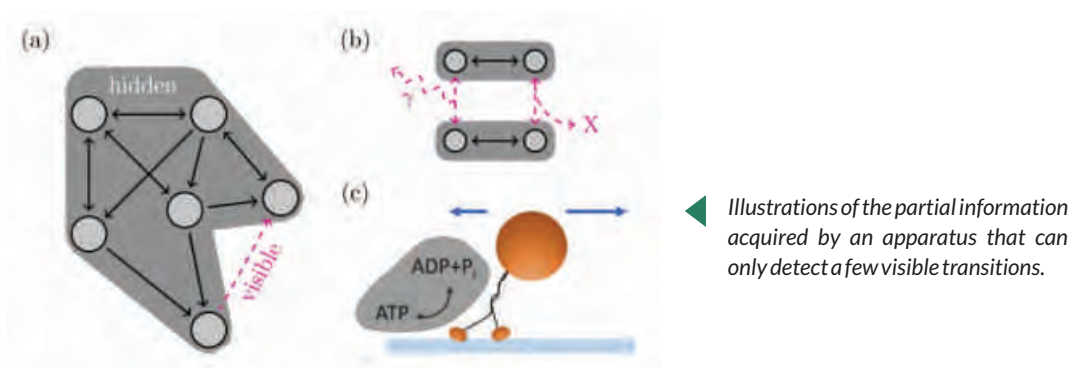
Ion trap setup at IISER Tirupati



- ▲ The storage efficiency of the wire trap is compared to that of a pole trap. With proper operating parameters, both traps are equally efficient in trapping, whereas the wire trap is nearly transparent to the laser allowing a wide range of experiments involving the interaction of photons with the store ions.

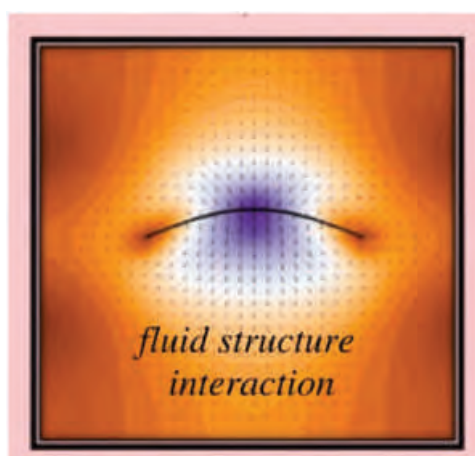
5.8 Physics of Living Systems

Dr Annwasha Dutta's research is on understanding the dynamics and properties of active biological systems. The Physical, chemical and biological microscopic systems open to interaction with their environment and subject to fluctuations have been studied until now using partial observation of states: decimating time-series, lumping states, separating fast and slow variables etc. However, these attempts have been limited by its construct because experimentally accessible phenomena are usually associated with the occurrence of transitions rather than occupation of (coarse-grained) states with partial information by considering only the statistics of a few visible transitions rather than states. In particular, they consider an observer who records a time series of occurrences of one or several transitions performed by a system, under the single assumption that its underlying dynamics is Markovian. They pose the question of how one can use the transitions' information to make inferences of dynamical, thermodynamical, and biochemical properties.



Most biological structures are typically submerged in aqueous solution, for example actin fibers or molecular motors submerged in fluid. Therefore, to study the chemo-mechanical dynamics of such submerged systems, one must understand their interaction with the fluid environment. However, fluid-structure interaction (FSI) analysis involves huge computational overhead, thus preventing us from studying the complex biological structures, for example a bundle of actin fibers submerged in fluid.

Dr Dutta's group, adopted a machine learning (ML)-based strategy to bypass the detailed FSI analysis that requires cumbersome simulations in solving the Navier–Stokes equations. To mimic the effect of fluid on an immersed structure, they introduced dissipation into the beam model with time-varying forces acting on it. The forces in a discretized set-up have been decoupled via an appropriate linear algebraic operation, which generates the ground truth force/moment data for the ML analysis. The adopted ML technique, symbolic regression, generates computationally tractable functional forms to represent the force/moment with respect to space and time. These estimates are fed into the dissipative beam model to generate the immersed beam's deflections over time, which are in conformity with the detailed FSI solutions. Numerical results demonstrate that the ML-estimated continuous force and moment functions are able to accurately predict the beam deflections.



▲ Dynamics of fibre submerged in fluid.

INSTITUTE COLLOQUIA

Date	Speaker	Affiliation	Title
07-04-2021	Prof Arindam Ghosh	Indian Institute of Science (IISc), Bengaluru	Bottom-up engineering of new electronic and structural effects with atomic layers
26-08-2021	Prof Steven Spallone	IISER Pune	A Chinese Remainder Theorem for Partitions
02-09-2021	Prof Tanusri Saha-Dasgupta	S.N. Bose National Centre for Basic Sciences (SNBNCBS), Kolkata	Quantum Materials by Computation: Challenges & Opportunities
30-09-2021	Dr Souvik Maiti	CSIR - Institute of Genomics and Integrative Biology (IGIB), New Delhi	FnCas9 Editor Linked Uniform Detection Assay (FELUDA)
28-10-2021	Prof Anindya Datta	Indian Institute of Technology (IIT) Bombay, Mumbai	Strategies for Enhancement in Light Emission from Fluorogenic Molecules and Semiconductor Nanocrystals
11-11-2021	Prof A J Parameswaran	Tata Institute of Fundamental Research (TIFR), Mumbai	Genuinely Ramified maps
12-01-2022	Prof Ruchi Anand	Indian Institute of Technology (IIT) Bombay, Mumbai	Strategies to Combat Antibiotic Resistance
19-01-2022	Dr Saikrishnan Kayarat	IISER Pune	Mechanisms of nucleotide-dependent restriction-modification enzymes: the potent bacterial defense against viral infection and horizontal gene transfer
09-02-2022	Prof Arvind Nair	Tata Institute of Fundamental Research (TIFR), Mumbai	Arcs in algebraic varieties
23-02-2022	Prof Kanak Saha	Inter-University Centre for Astronomy and Astrophysics (IUCAA), Pune	Extreme-UV photons from high redshift galaxies
23-03-2022	Prof Gautam Bharali	Indian Institute of Science (IISc), Bengaluru	The Pick interpolation problem

DEPARTMENTAL SEMINARS/TALKS



BIOLOGY

Date	Speaker	Affiliation	Title
12-04-2021	Dr Manoj Prasad	DBT - National Institute of Plant Genome Research (NIPGR), New Delhi	Battle against viruses: small RNAs as the defenders
05-07-2021	Dr Subhadeep Chatterjee	DBT - Centre for DNA Fingerprinting and Diagnostics (CDFD), Hyderabad	Understanding the social language of bacteria: Speak or not to speak?
26-07-2021	Prof Ganesh Nagaraju	Indian Institute of Science (IISc), Bengaluru	Unraveling the new roles of RAD51 paralogs and FANCD1 helicase in genome maintenance and tumor suppression
09-08-2021	Prof Ashwani Pareek	DBT - National Agri-Food Biotechnology Institute (NABI), Mohali	Ensuring food security to feed nine billion
14-09-2021	Dr Soumen Basak	DBT - National Institute of Immunology (NII), New Delhi	Intestinal inflammation gone awry!
09-11-2021	Dr Gopaljee Jha	DBT - National Institute of Plant Genome Research (NIPGR), New Delhi	Conversion of a defensive toxin-antitoxin system into an offensive T6SS effector in Burkholderia
09-11-2021	Dr Luiz Carvalho	Francis Crick Institute, London, UK	Allosteric De-Regulation of Metabolic Pathways as a Novel Antibiotic Strategy
01-02-2022	Dr Sudha Rajamani	IISER Pune	The Astrobiological Narrative of Life's Origin
01-03-2022	Dr Arnab Mukhopadhyay	DBT - National Institute of Immunology (NII), New Delhi	Gene-diet interactions that maintain optimal life span: lessons learnt from a tiny nematode
22-03-2022	Dr Sanjukta Mukherjee	National Centre for Biological Sciences (NCBS), Bengaluru	Probing RNA structure by rationally design small molecule to reprogram RNA mediated cell fates



CHEMISTRY

01-04-2021	Prof Amartya Mukhopadhyay	Indian Institute of Technology (IIT) Bombay, Mumbai	Tuning the transition metal oxides towards achieving water-stability and high voltage electrochemical stability as cathode materials for alkali metal-ion batteries
15-04-2021	Dr Prabhu Dhasaiyan	University of Strasbourg, France	Audible Sound for Life-like Behaviour and Controlling Chemical Complexity
22-04-2021	Dr Santanu Mukherjee	Indian Institute of Science (IISc), Bengaluru	Ir-Catalyzed Enantioselective C(sp ³)-H and C(sp ²)-H Allylic Alkylations
20-05-2021	Dr Debashis Adhikari	IISER Mohali	A nickel catalysed alcohol oxidation and N-alkylations mediated by hydrogen atom transfer
03-06-2021	Dr R S Swathi	IISER Thiruvananthapuram	Swarm Intelligence Guided Global Minima Search on Complex Potential Energy Surfaces

Date	Speaker	Affiliation	Title
10-06-2021	Dr Santanu Kumar Pal	IISER Mohali	Highly Efficient Ambipolar Charge Transport in Semiconducting Discotic Liquid Crystals
08-07-2021	Dr A T Biju	Indian Institute of Science (IISc), Bengaluru	Organocatalysis Using N-Heterocyclic Carbenes (NHCs)
22-07-2021	Prof Ramanathan Vaidyanathan	IISER Pune	Covalent Organic Frameworks - Modular Polymers for Energy Science
05-08-2021	Dr Abhijit Patra	IISER Bhopal	Playing with the building blocks: the genesis of task-specific porous organic polymers
20-08-2021	Dr Sudipta Basu	Indian Institute of Technology (IIT) Gandhinagar	Image and Impair Cellular Powerhouse in Cancer
03-09-2021	Prof ChillaMalla Reddy	IISER Kolkata	Crystal engineering of adaptive smart materials: from mechanical bending to self-healing
19-11-2021	Prof P Thilagar	Indian Institute of Science (IISc), Bengaluru	Extending BN/C=C Isosterism for Developing Novel Functional Materials
20-11-2021	Dr Ganesan Balakrishnan	Sudarshan Chemical Industries Ltd., Pune	Chemistry - A Challenging and Rewarding Career Option
28-01-2022	Dr Sarit S Agasti	Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR), Bengaluru	Super-resolution Imaging and Optical Barcoding via Host-Guest Molecular Recognition
04-02-2022	Prof Jyotirmayee Dash	Indian Association for the Cultivation of Science (IACS), Kolkata	Small Molecules, DNA and Self-assembly
11-02-2022	Dr Moumita Majumdar	IISER Pune	Designing Ligand Molecules to Battery Anode Materials using the Main-group Handle
04-03-2022	Dr Anirban Hazra	IISER Pune	The Intriguing Chemistry of Molecules in Excited States
25-03-2022	Dr Chandramouli Subramaniam	Indian Institute of Technology (IIT) Bombay, Mumbai	Green heat generation using nanostructured porous, hard carbons: from science to applications



24-06-2021	Prof Jair Koiler	Juiz de Fora Federal University, Brazil	Hydrodynamical vortices on surfaces
03-09-2021	Prof Patrick Dasgupta	University of Delhi	The enigma of supermassive black hole formation
17-09-2021	Prof Anindya Das	Indian Institute of Science (IISc), Bengaluru	The magic land of magic-angle twisted bilayer graphene
17-02-2022	Dr Ravi Kumar Pujala	IISER Tirupati	Self-assembly of nematic colloids
24-02-2022	Prof T S Mahesh	IISER Pune	Spin Processors: Quantum Control & Characterization
31-03-2022	Prof Supratik Pal	Indian Statistical Institute (ISI), Kolkata	How many parameters for our Universe?

SCIENTIFIC EVENTS ON CAMPUS

MEETING ON PEDAGOGY AND ONLINE TEACHING PRACTICES

May 10-11, 2021

This first Franco-Indian virtual meeting in the series was organised by Ecole Normale Superior and IISER Tirupati with the support of the French Embassy in India. The meeting focused on the exchange of practices in education and pedagogical approaches, as well as the adaptation to online teaching in the current pandemic context. The constructive discussions during this two-day meeting allowed both ENS and IISER faculties to identify similarities and complementarities to lay the foundations for future developments.

MINI-SYMPOSIUM ON NUCLEIC ACIDS (VIRTUAL MEETING)

May 25, 2021

A virtual "Mini-Symposium on Nucleic Acids" was organized on May 25, 2021 by IISER Tirupati. It was attended by students/faculty of various universities/institutes, a researcher from the pharmaceutical industries and IISER Tirupati students and faculty. There were four lectures given by researchers working in the forefront of the area of nucleic acids. The future of nucleic acids for designing detection platforms and their use in therapeutics was discussed, in addition to their utilization in basic biology research.

INTER IISER-NISER MATHEMATICS MEET (IINMM) 2021

July 12-14, 2021

The Inter-IISER-NISER Mathematics Meet is a joint initiative of all the IISERs and NISER. It aims to provide a platform for discussion among mathematicians to enable fruitful collaborations across these institutes. IISER Tirupati hosted IINMM 2021, the fourth meeting in the series.

INTRODUCTION TO QUANTUM OPTICS

July 19-30, 2021

CAMOST, the Center for Atomic, Molecular, and Optical Sciences & Technologies, a joint initiative of IIT Tirupati and IISER Tirupati, organised a short online course on 'Introduction to Quantum Optics'. Professor Sonjoy Majumder, Department of Physics, Indian Institute of Technology Kharagpur, chaired the course, delivering the key talks. Topics covered include an introduction to Quantum Optics, including a brief discussion on history, achievements, and scope, the Quantization of Light, etc. In addition to the regular lectures, the course consisted of assignments and tutorial sessions.

CAMOST'S FIRST ANNIVERSARY COLLOQUIUM SERIES

August 16-20, 2021

The Center for Atomic, Molecular, and Optical Sciences & Technologies (CAMOST), a joint initiative of IIT Tirupati and IISER Tirupati, was inaugurated on the eve of the 73rd anniversary of India's Independence Day by Dr Arabinda Mitra (Scientific Secretary, Office of the Principal Scientific Advisor, Government of India). To commemorate the nucleation of CAMOST, we conducted the Camost Anniversary Week Colloquium Series

from 16-20 August 2021. Prof Roland Wester delivered a lecture on the Controlled interactions of cold trapped negative ions, and Prof Aravind Gopalan spoke about the Intermolecular coulombic decay in molecules of astrophysical interest.

HUMBOLDT DAY 2021

September 18, 2021

Indian biogeographers organized a set of talks from leading biogeographers from across the globe, with four scientists describing patterns and processes in diverse taxa. It was organized by National Centre for Biological Science (NCBS), Bengaluru, IISER Tirupati, and CSIR- Centre for Cellular and Molecular Biology, Hyderabad, and was part of the Azadi Ka Amrith Mahotsav initiative of the Government of India.

MOLE DAY

October 18, 2021

Chemistry enthusiasts at IISER Tirupati celebrated the global annual event of Mole Day, which commemorates the description of Avogadro's Number (6.02×10^{23}), a basic measuring unit in chemistry. In a program spanning over half the day, students and researchers gave talks on their research and basic concepts in chemistry.



SOFT MATTER DAY

October 30, 2021

The Physics Department of IISER Tirupati organized a one-day Soft Matter symposium on 30th October 2021. Prof Sanjay Puri of Jawaharlal Nehru University, New Delhi delivered a talk entitled "Kinetics of Phase Transitions" and Prof Shankar Ghosh of TIFR, Mumbai presented a talk entitled "Shapes and functions". Dr Dileep Mampallil and Dr Ravi Kumar Pujala, faculty members of IISER Tirupati also delivered talks. The students and research scholars enthusiastically participated in Poster presentations.

GREAT BACKYARD BIRD COUNT (GBBC) AND CAMPUS BIRD COUNT

February 18-22, 2022

The Great Backyard Bird Count (GBBC) is a global online four-day-long citizen science event to collect data on birds in real time. It was launched in 1998 by the Cornell Lab of Ornithology and the National Audubon Society, USA, and many lakhs of citizen birders participate. In India alone, 3782 birders recorded 1017 species in more than 41,000 checklists, among which 1687 were from Andhra Pradesh. In Tirupati, IISER Tirupati submitted 766 checklists collectively from the Yerpedu and Mangalam campuses, standing 5th and 7th respectively in the nationwide Campus Bird Count. 128 species of birds were observed around the Mangalam campus and 96 around the Yerpedu campus.



SYNAPSE 2021

December 3-4, 2021

In its second year, this annual neuroscience mini-symposium hosted at IISER Tirupati brought together a diverse assortment of neuroscientists from India and across the world. Synapse 2021 featured two days of regular talks by established and early-career researchers in the field, as well as lightning talk sessions by PhD students and post-doctoral fellows. An exciting line-up of speakers working in diverse areas of neuroscience gave inspiring talks; spanning topics like the development of the hippocampus, maintaining order in the adult brain, brain-behaviour interactions from rodents to ravens, molecular mechanisms underlying neurodegenerative diseases, and the use of brain organoids to decode CNS pathologies.

PLANT DEVELOPMENTAL PLASTICITY: A MOLECULAR PERSPECTIVE

September 27-29, 2021

IISER Tirupati, together with the Department of Botany and Microbiology Acharya Nagarjuna University, Guntur, organised the second plant developmental plasticity webinar, featuring both national and international speakers. Topics covered included seed development, dormancy and germination, cell fate and tissue patterning in the development of shoot, root and leaf, shoot and root apical meristem activity and indeterminate growth habit, transcriptional and epigenetic regulation of plant development and senescence, developmental plasticity and environmental signals, etc.

FOUNDATION DAY

March 28, 2022

IISER Tirupati celebrated its 7th Foundation Day on March 28, 2022 in a hybrid event. The chief guest was Prof Rajesh Gopakumar, Director, International Centre for Theoretical Sciences (ICTS-TIFR), Bangalore, who spoke about strings ("Why Strings?"). Following this, there was an award ceremony where the Director, Prof KN Ganesh gave out awards to deserving staff on campus.



Director K N Ganesh appreciating the commendable efforts of the IT section towards setting up infrastructure on the permanent campus.

VEEKASHANA

Veekashana is the Forum of Women's Scientists of IISER Tirupati and regularly organises talks and interactive sessions with eminent women scientists from within and outside the country. On the occasion of Curie Day, November 7 2021, Prof Francoise Combes, Professor at Collège de France and Astronomer at Paris Observatory, spoke about Super-massive Black Holes. On February 19, 2022, Prof Sujatha Ramdorai, University of British Columbia gave a talk on her journey as a mathematician. On March 8, 2022, Prof Sc Elena Surovyatkina, from the Complexity Science Group of Potsdam Institute for Climate Impact Research (PIK), Germany, spoke on predicting the Indian summer monsoon onset and withdrawal in Central India and Delhi.

CENTER FOR CAREER AND PROFESSIONAL DEVELOPMENT (CCPD)

The Center for Career and Professional Development (CCPD) at IISER Tirupati provides a platform for our students to explore rewarding career opportunities. The vision and mission of CCPD can be found on our website: <http://www.iisertirupati.ac.in/ccpd/>

During the past year, the center periodically conducted seminars/webinars, workshops, interaction sessions with alumni, and focused sessions on international research opportunities. Guest lectures included people from academia, the industry as well as entrepreneurs.

An interesting talk on career options was given on March 7, 2022, by an IISER Tirupati alumni, Mr Chiranjeevi N, currently at Alfred Wegener Institute Helmholtz Centre for Polar and Marine Research, Potsdam, Germany. He discussed “Opportunities in Climate Science: How to leverage the maximum out of the Interdisciplinary Course Structure in the BS-MS Program @ IISER Tirupati”. This was a very exciting session and brought an interesting student perspective on research opportunities that IISERs can provide.

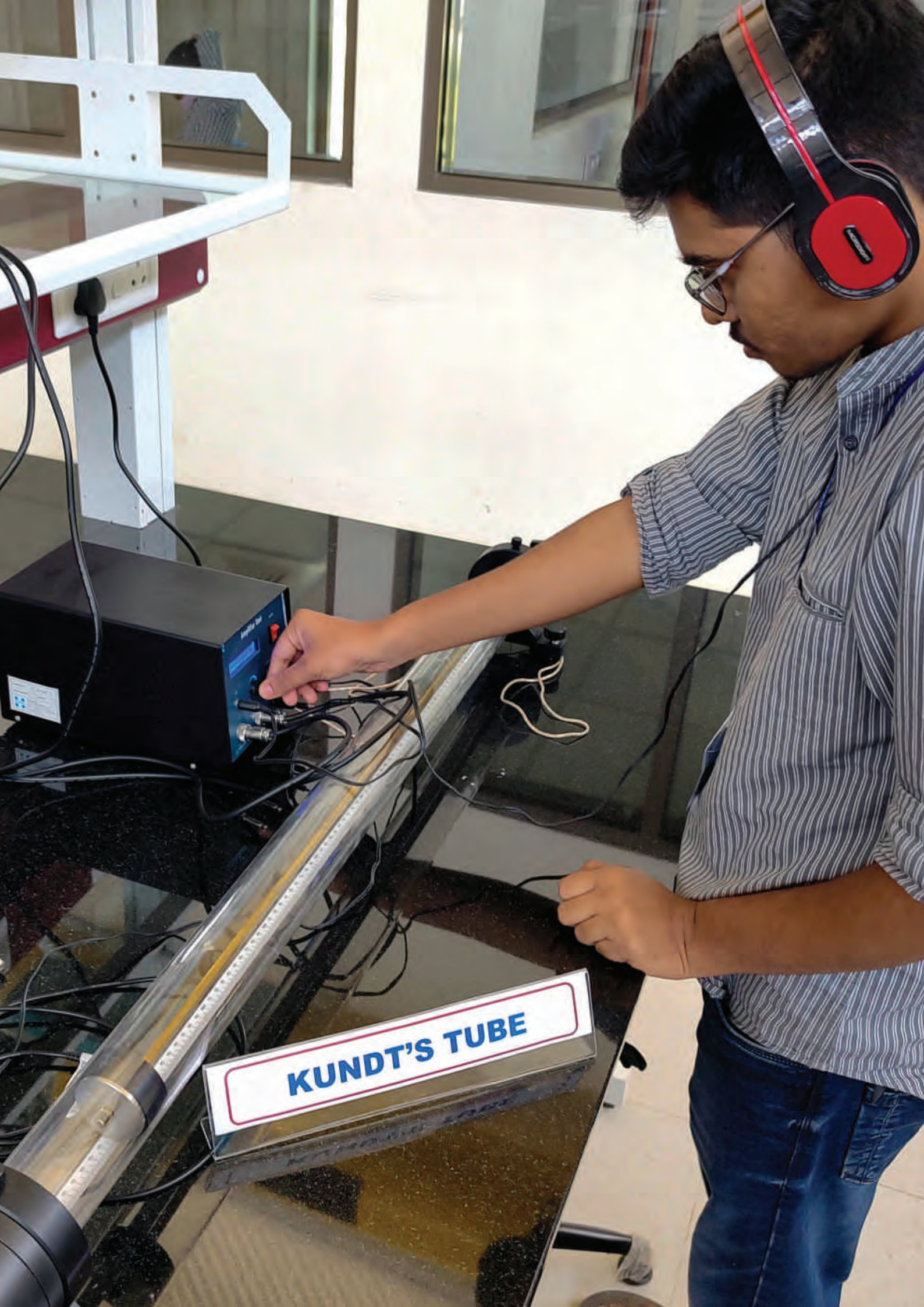
Prof Vivek Prakash, University of Miami, USA, rendered an interdisciplinary talk on Marine Biophysics on October 22, 2021. Prof Prakash is interested in collaborating with IISER Tirupati, and this webinar provided our students a glimpse of the various interdisciplinary research options.

In addition, CCPD also conducts regular sessions with U.S.-India Educational Foundation (USIEF) and DAAD. These sessions provided students with information about research and other career opportunities in USA and Germany, respectively.

In order to provide insight into the world of industrial research, CCPD organized a webinar with Dr Ganesan Balakrishnan, General Manager of Sudarshan Chemicals. His webinar, conducted on November 20, 2021, illustrated to our students on how a career in the chemical industry can be a challenging but rewarding option.

CCPD organized a session for our students with a few of our alumni: Mr Aditya Kulkarni (ESSEC Business School, France), Mr Jithen Chander (IIM Ranchi), and Mr Parth Rajauria (Data Engineer at 6th Energy Technologies Pvt. Ltd). They discussed MBA opportunities in India and abroad as well as opportunities available in the industry for students with an IISER background.

In the past year, CCPD also organized campus recruitment with Deloitte for math majors and with Syngene for biology majors. The students were trained for corporate interviews, and a couple of IISER students were given offers by the two companies.



KUNDT'S TUBE

CAMPUS



CAMPUS

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OUTREACH ACTIVITIES

Alongside the primary mandates of IISER Tirupati for education and research, students and researchers on campus actively engage in the communication and spread of science in society. IISER Tirupati has an active Outreach Program that spreads scientific knowledge and temper to organisations around Tirupati and Andhra Pradesh, specifically focusing on schools and universities in the neighbourhood. While the pandemic has reduced on-campus activities like hosting school children and showcasing our labs and scientific experiments, we have continued our efforts online, as well as on other campuses. In addition to engaging with other educational institutions, we also engage with government organisations in the state, encouraging scientific dialogue and communicating scientific findings.

BRINGING CHEMISTRY TO SCHOOL STUDENTS

The Department of Chemistry and the Outreach team at IISER Tirupati organized a scientific session for students and faculty of Kendriya Vidyalaya, No.1 in Tirupati on February 5, 2022. The event was hosted by Dr Nirmala Krishnamurthy, and the introduction was provided by Prof Pillai, Chair of the Department of Chemistry. Three of our Chemistry faculty, Dr Rajesh Viswanathan, Dr Janardan Kundu and Dr Aravindan V, discussed the importance of natural products, smart materials and Li-ion batteries respectively. Around 60 students and faculty of Kendriya Vidyalaya participated in this lively discussion on the role of chemistry in our daily lives.

TALKING SCIENCE WITH THE ANDHRA PRADESH GOVERNMENT

The Department of Science and Technology (GoI) and the Andhra Pradesh State Council of Science and Technology (APCOST) organized a session on Science Communication and Popularization on February 23, 2022. Representatives of various foundations and institutes in Andhra Pradesh participated in the session and discussed the various outreach activities organized in their respective institutes. Dr Nirmala Krishnamurthy from the Chemistry department explained the various outreach activities organized/conducted by the outreach team at IISER Tirupati. This included several faculty and student-run outreach programs, the Science Day celebrations and the workshops/webinars conducted as part of pedagogy and curriculum development.

NATIONAL SCIENCE DAY

National Science Day is celebrated every year with great enthusiasm by the IISER community. This year, the National Science Day celebrations included an invited talk by Prof Ganpati D Yadav, followed by the experience shared by the three time gold-winning iGEM team. Parallely, the Outreach committee worked together with several student clubs and conducted a national-level science quiz competition, an escape room game, and a popular science talk that explained the use of Astrophysics in day-to-day life activities. The science quiz competition was open to undergraduate students from colleges/institutes/universities across the country. 'Communicating Science through Art' was a first-of-its-kind competition that was open to IISER students, where the students had the choice to explain their research or an idea to meet the global sustainable development goals. Celebrations and events spanned two days, starting on 27th February and ending on 28th February 2022.

BIODIVERSITY OUTREACH AND CITIZEN SCIENCE PROGRAM

IISER Tirupati has a vibrant and growing Biodiversity Outreach and Citizen Science Program, which organises events and provides training in awareness of biodiversity around Tirupati and Andhra Pradesh. IISER Tirupati is uniquely positioned in being located at the foothills of the Seshachalam Hills, Eastern Ghats, and our Biodiversity Outreach program aims to highlight the unique ecological value of the landscape. Listed below are some of the activities of the program in the past year.

Nature walks on campuses

Nature walks and guided bird walks were conducted on various campuses around Tirupati - Regional Science Centre, Sri Venkateswara University, Sri Venkateswara Veterinary University, Sri Venkateswara Agriculture Research Station, Padmavati Women's University and Indian Institute of Technology in Tirupati. A nature walk was also conducted for teachers of the AP Model School, Gampalagudem, in the Krishna district.



Advisory role with Andhra Pradesh State Department

On invitation from the Andhra Pradesh State Biodiversity Board, Mr Raja Sekhar Bandi, as an expert, provided orientation on habitat protection for birds for the Biodiversity Monitoring Committees (BMCs) of 5 districts from Andhra Pradesh. This was a part of the workshop "Thematic planning for Aquatic Biodiversity and Conservation of Rare Endangered & Threatened species through BMCs".

Training modules for Andhra Pradesh Forest Department Beat Officers

The Andhra Pradesh Forest Department recruited 280 beat officers in 2021. The State forest academy at Rajahmundry facilitated a 15-day orientation program for these newly recruited officers and requested IISER Tirupati to support with training on the identification of birds. A total of 180 officers were trained by Mr Raja Sekhar Bandi, and multiple in-house sessions were conducted at the Forest Academy, followed by a day-long field training session in Papikonda National Park. This training was conducted in 4 batches of 40-50 officers in each batch.



Great Backyard Bird Count 2022 across Andhra Pradesh

During the international Great Backyard Bird Count event of 2022, IISER Tirupati's Biodiversity Outreach Program facilitated the participation of naturalists and birders from across the state, encouraging them to identify birds and submit data. For the first time, bird data were submitted from across the state of Andhra Pradesh during the Great Backyard Bird Count event. As the state coordinator of this global event, Raja Sekhar Bandi, in liaison with other birdwatchers from the state of Andhra Pradesh, successfully generated bird data again from all 13 districts of the state. Only 2-3 other states in the country achieved this.

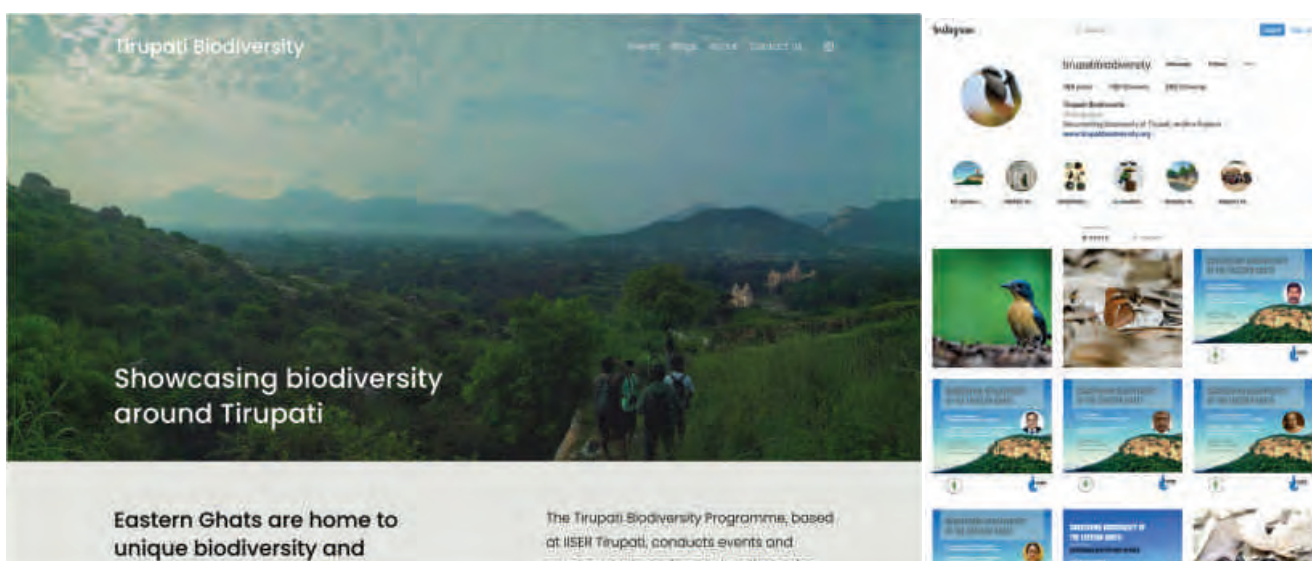


Young Naturalists of Andhra Pradesh Program

This is a Citizen Science Project supported by India Bioscience, aimed at exposing young minds in Andhra Pradesh to the world of natural history. Students from schools and colleges joined the program to observe & document forms of life, upload their data to the global citizen science platform iNaturalist and won prizes. Instructional videos on using the iNaturalist application and participating in the Young Naturalists of Andhra Pradesh project are designed and uploaded to the project website at <https://tinyurl.com/yc88n76h>

Showcasing efforts Online: Tirupati Biodiversity

In order to highlight the biodiversity of this unique region and showcase our efforts to a wider audience, we have launched a website and a social media handle with the name 'Tirupati Biodiversity'. Tirupati Biodiversity <https://www.tirupatibiodiversity.org/> is a site for listing ecological events/meetings in the region as well a place where one can read about biodiversity and ecological issues in the region. Articles are written by students and researchers at IISER Tirupati, and students are routinely involved the creating content and managing the website in semester-wise batches. This allows students to understand how science communication works, and gives them a public outlet for writing popular science articles. We also manage an accompanying social media handle on instagram @tirupatibiodiversity <https://www.instagram.com/tirupatibiodiversity/?hl=en>, which is also managed by students and researchers on campus.



NATIONAL CELEBRATIONS

In the year 2021-2022, IISER Tirupati celebrated several days of national importance on both the Mangalam (transit) and Yerpedu (permanent) campuses. Many of these events were also simultaneously celebrated online to ensure greater attendance of the IISER Tirupati community during the Covid-19 pandemic.

Independence Day (15 August, 2021) was celebrated on both the Yerpedu (permanent) and Mangalam (transit) campuses as was Republic Day (26 January, 2022).



▲ Independence Day, Yerpedu campus



▲ Independence Day, Mangalam campus

National Education Day (November 11, 2021) was celebrated online, and Prof BJ Rao, the Vice Chancellor of University of Hyderabad delivered a talk on Education, the National Education Policy (NEP) of India, and how the NEP will shape Education in India in the years to come.



▲ Prof BJ Rao's talk on National Education Day

Days celebrated included International Yoga Day (21 June, 2021), Gandhi Jayanti (October 02, 2021), Constitution Day (26 November, 2021), International Women's Day 2022 (08 March, 2022), and so on.

IISER Tirupati organized a special lecture on the occasion of the 152nd birth anniversary celebrations of Mahatma Gandhi. Prof. Ajay Skaria, College of Liberal Arts, University of Minnesota, USA has delivered a lecture on "How and Why Gandhi Matters Today?"

STUDENTS' ACTIVITIES

IISER Tirupati students enjoy several activities organised via various student-run clubs. The campus hosts more than 20 student clubs mentored by faculty members. To promote student activities, the institute allocates funds that can be utilized by the Committee of Student Activities (COSA).

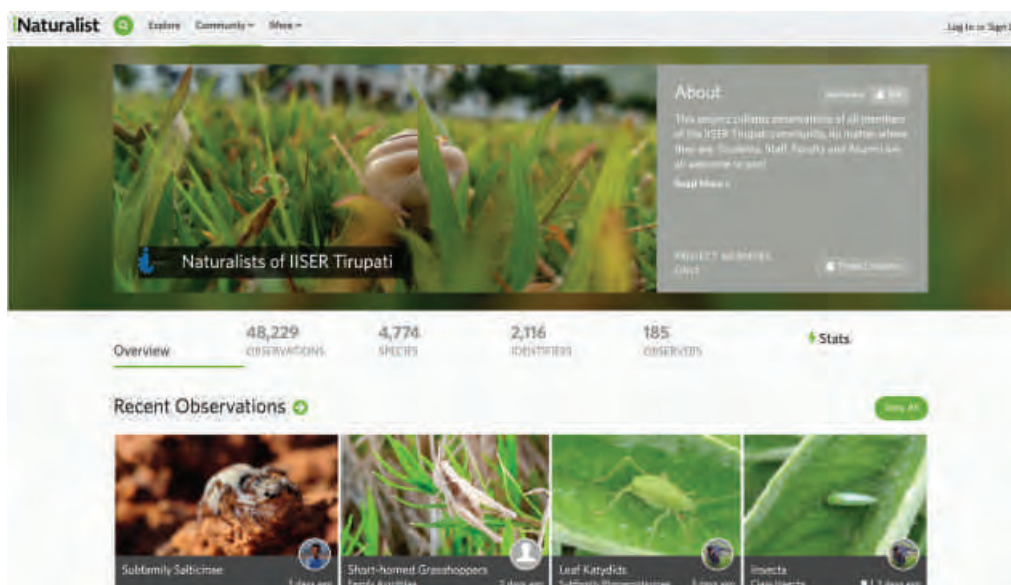
The lockdown period saw the emergence of several new clubs, such as the quantum club, ECS club, philosophy club, speedcubing club, music club, mental health club and a few more. All student clubs have actively maintained social media pages on Facebook and Instagram and posted details of all their events online.

Abhiprajna The second edition of Abhiprajna: the annual science quiz competition organised by the students of IISER Tirupati, was in July 2021 and saw participation from 60+ colleges throughout India. The theme for this edition was the consequences of climate change and was titled "Calm, Cataclysm, Chaos". As part of the finals, 6 teams participated in a debate and presented a solution to a multi-disciplinary problem to 5 national researchers. IISER Kolkata won the finals and received a cash prize worth Rs 10,000.

Anurakti During the past year, the dance club of IISER Tirupati organised the launch of its logo, conducted regular zoomba sessions via the Zoom platform and introduced the "Bhaav series", which aimed to introduce different Rasa's- Shringara, Haasya, Karuna, Raudra, Veera, Adbhutha, Shaantha and Bheebastha. The members of the club also performed on important days such as Independence day, Ganesh Chaturthi and Halloween.

Arts Club The club organized several creative events on campus, such as Halloween Celebration: Fiendfest 2021, the Character Creation Contest- Riddikulus, the Redesigning event- Stealing your He(Art) for Ethnic Day 2022, Pride Month - Queer Strokes and a Rangoli competition.

Birding and Trekking Club The birding and trekking club is a platform for naturalists to share information and discuss research topics in Ecology, Evolution, Conservation, and Citizen Science. Members of the club actively explore the Tirupati landscape and document wildlife. A key activity involves conducting



birding trips around both the Yerpedu and Mangalam campuses and nature walks to nearby biodiversity hotspots (e.g., Mamanduru Reserve Forest, IIT Tirupati, Kapila Theertham, and areas around the Yerpedu campus). The club also conduct sessions on bird identification and making the best use of online citizen science resources. Apart from the weekly birding and trekking activities, the club has also been participating in a broad range of projects, some of which are Tirupati urban biodiversity mapping (an IISER Tirupati project), and international events like the Great Backyard Bird Count, and Campus Bird Count, National Moth Week. Through these activities, members have generated a large amount of ecological data, most of which can be seen on the group page on iNaturalist page Naturalists of IISER Tirupati <https://www.inaturalist.org/projects/naturalists-of-iiser-tirupati>. In the past year, club members recorded 128 species of birds during GBBC 2022, 1000+ observations of moths during National Moth week, and in total, more than 48,000 observations on the iNaturalist platform through the years.

Bio Wissen The biology club of IISER Tirupati conducted the annual online event - “The Lockdown Laboratory”. Other events included symposiums on Developmental Biology: The Evo-devosium, Sci-Scribe II: a science communication event and the Bio-Triathlon: organized in collaboration with the biology clubs of IISER TVM and IISER Bhopal. The club also initiated “Word o' Wissen” and “Saturday Starlight” sessions for talks and discussions amongst IISER Tirupati students. Bio Wissen also conducted a 2-day workshop on “Biology for Python” with Mr Kumaresh Krishnan, a PhD fellow at the Florian and Engert lab, Harvard University.

Celestic The Astronomy and Astrophysics Club of IISER Tirupati organized several guest talks from researchers around the world as well as the series talks - The Solar System Series, The Paradoxes Series, Space Missions series and a mini-series on Stellar Astrophysics. The club organized live streaming of celestial events/missions and stargazing sessions for propagating awareness and enthusiasm among students. Celestic was also in collaboration with CAMS (Cameras for Allsky Meteor Surveillance) India - a venture by Indian Institutes for meteor surveillance.

Chess Club Several practice sessions and tournaments, such as the Arena session, Rapid session and Blitz session, were conducted by the chess club of IISER Tirupati.

Fovea The photography club of IISER Tirupati was involved in covering all the events on campus and organized photography workshops and photo walk sessions for club members. The club also conducted “Wildflix”, which helped increase people's interactions with nature and a Holi photography competition to help capture the beauty of a colourful festival.

Literary club The club has conducted several activities such as literary quizzes, Pictionary, a month-long “Readathon” session, a horror writing competition called Séance for Halloween and coordinated an elocution competition for Matribasha day.

Math Club The club conducted weekly sessions on specialized topics and celebrations as part of Ramanujan Day and Pi Day.

Shemushi The quiz club of IISER Tirupati conducted several quizzes throughout the year to mark several events on campus. This included the independence day quiz, the science day quiz, the “Olympics quiz”, a “pans pop quiz” for wildlife day, an earth day quiz and a paranormal activity quiz for Halloween. In addition, the club also conducted quizzes on cartoons, monsoon festivals and America: a mystery bag.

Speed cubing This new club started with a tutorial session for beginners and conducted regular live practice sessions every week. Guest speakers were invited to share their cubing journey, and a session on mathematical analysis of the Rubik's cube was held to understand the math behind cubing.

Swadhyaya The mental health club of IISER Tirupati conducted a series of sessions: “Mind your mind” with Ms Usha Gautam, Counsellor, SCARF, Chennai.

Synergy The chemistry club of IISER Tirupati organized a “Lockdown Talk Series” with guest lectures and student presentations. They also organized chemistry quiz competitions such as Alchemy, Molarity, The Mole Day Quiz as well as Elemental, My Dear Watson – an escape room event for Science day.

Unnati The Outreach team of IISER Tirupati students regularly visited SOS Village children and conducted sessions on Math, Science and English. They also organized several events such as SCIPOP, Journey through our Stellar Backyard, A Spooky Scientist Session for Halloween, A tour of the night sky and Celestial Events: Good or Evil? The club also organized a cloth donation drive and started career guidance sessions for SOS Village children.



Sports Activities Sports is a part of life at IISER Tirupati, and the institute is well-equipped with a gym, football, basketball, badminton, and volleyball courts, as well as a ground for various athletics events at the transit campus. Over the past year, several facilities such as an outdoor gym and badminton and basketball courts have also come up at the permanent campus. The institute also organized a month-long IISER Tirupati Cricket league (ITCL 2022) and a football tournament, the Institute Football league (IFL 2022).

Campus Gardening The students at IISER Tirupati, mentored by Dr Eswarayya Ramireddy, raised a kitchen garden outside the hostel at the Yerpedu campus. Several students and three institute gardeners prepared the land and planted seedlings of vegetables, such as spinach, radish, tomato, brinjal, okra, green chillies, and cabbage, and flowering plants, such as marigold, Crossandra, and roses. They also planted fruit species such as papaya and medicinal plants like lemon grass. All vegetables were grown without adding any chemical fertilizers and pesticides, and the harvested vegetables were used in the institute canteen/hostel mess.



CAMPUS SUPPORT SYSTEM

SUPPORT STRUCTURE AND FACILITIES

IISER Tirupati is run by a competent administrative setup comprising several sections. This dedicated team manages both the permanent and temporary campuses at Yerpedu and Mangalam, respectively. They also work with the engineers and their teams to execute the ongoing construction of the permanent campus.

Administration

The Administration section is headed by the Registrar and comprises 05 employees (One Deputy Registrar, two Assistant Registrars and two Office Assistants). The Administration section is responsible for all daily administrative activities involved in managing both campuses, correspondence with the Ministry, processing of claims, recruitment of personnel to regular positions and under various research projects, maintaining personal records, service books, and Annual Performance Appraisal Reports. They are also in charge of training staff and managing security, housekeeping, and transport services for both campuses.

The Guest House and Dining facilities at the Institute are managed by the Office Superintendent.

The Finance and Accounts section handles the preparation of budget estimates, payments of vendor bills, monitoring of expenses under various account heads, internal audit of payments and disbursements, tax compliances, preparation of the Annual Accounts, and interaction with the audit team of CAG (Comptroller and Auditor General of India). The Accounts Section comprises of One Deputy Registrar, One Office Superintendent & four Office Assistants.

The Purchase section of the Institute looks after the regular procurement, Inventory Management and issuance of material required for the entire institute and finalizes the rate contract, maintenance, and service related tenders. The procurement process is managed through the Central Public Procurement Portal (CPPP) and Government eMarket (GeM). The Purchase Section comprises One Deputy Registrar and four Office Assistants.

The Academic section handles all aspects pertaining to the student admission process, timetable and classroom requirements, conducting exams, and maintaining student records. The Academics Section comprises of One Deputy Registrar, One Office Superintendent, four Office Assistants and two supporting staff.

IT section manages IT services, networking, hardware maintenance, website maintenance, intranet and internet services besides ERP system. The IT Section comprises of One Technical Officer (IT), One Networks Engineer, two Technical Assistants, One Office Assistant and four supporting staff.

The Engineering Section oversees the entire construction activities in the permanent campus and attends to the Repair & Maintenance activities on the transit campus. They also handle the civil construction works required by the Institute and are in charge of the estate activities on the campus. The Engineering Section comprises One Superintending Engineer, One Executive Engineer (Electrical), Two Assistant Engineers (one Electrical & one Civil), One Junior Engineer (Civil) and One Office Assistant.

The Instrumentation Section is responsible for recording, upkeep and maintenance of all the academic and research equipment in the campus. Presently, the Instrumentation is handled by a Technical Officer (Instrumentation) and the Technical Assistant (Instrumentation).

Library

The GN Ramachandran Library houses a good collection of textbooks, general books and reference books such as encyclopedias, dictionaries, laboratory manuals etc. The library also provides online access to various journals and bibliographic and full-text databases in the field of basic sciences and allied subjects. The Library is a member of the e-ShodhSindhu and IISER Library Consortium. The library uses the Koha Integrated Library Management System, an open-source software, for maintaining records of materials in circulation.

Over 150 books have been added to the library collection during the last financial year. The collection statistics of the Library as on March 31, 2022, include 7942 books, 322 Gratis books, 22 print journals/magazines, 2295 online journals and 9 online databases. Much of the online material can be accessed via the remote access software MyLOFT (My Library on FingerTips), which can be installed on computers and mobile devices.

In addition, the library also manages campus-wide access to Grammarly, an online writing assistant that helps users to correct spelling and grammar while improving clarity in writing. The library also conducts plagiarism checks for all theses and dissertations written on campus, using Urkund, a plagiarism detection software provided by INFLIBNET through ShodhShuddhi.

Wellness clinics

IISER Tirupati operates two wellness clinics - one on each of its campuses, in Mangalam (temporary) and Yerpedu (permanent). All students and staff members can avail themselves of medical facilities like consultation, random blood sugar checks, intravenous therapy, vaccination, oxygen support, nebulization, routine health checks and first aid and emergency care at the Wellness Clinics. A Medical Officer is available for consultation across both campuses, and each campus has a full-time nurse. IISER Tirupati has tie-ups with local hospitals and provides referral services. A 24×7 emergency ambulance service is available on Campus to transport students and employees in cases of emergency.

The Clinic also facilitates reimbursements for regular medications for employees and dependents as permissible under CGHS rules. During the Covid-19 pandemic, the clinic sent out regular health advisories to all on campus with detailed instructions to avoid the spread of the pandemic. The clinic also coordinated the availability of covid vaccines for those who required this and recommended local clinics that they could contact.

Living on campus

IISER Tirupati runs hostels for both boys and girls on both the Mangalam and Yerpedu campuses. Over the past year, the second and third-year BS-MS students have been accommodated at the new hostel block on the permanent campus (Yerpedu), while the fourth and fifth-year BS-MS students reside on the transit campus (Mangalam).

IISER TIRUPATI IN THE NEWS

9/14/22, 11:19 AM

AICTE introduces free 12-week course on ornithology - Times of India

Printed from

THE TIMES OF INDIA

AICTE introduces free 12-week course on ornithology

TNN | Dec 13, 2021, 04:54 AM IST

Aurangabad: The All-India Council for Technical Education (AICTE) has introduced a free course on ornithology (study of birds). The free course — basic course in ornithology — is a 12-week long course that has been introduced by AICTE as part of SWAYAM, a central programme designed to achieve the principles of access, equity, and quality in education.

"The course intends to introduce students to the scientific study of birds. It covers the basics of a range of topics like bird anatomy, physiology, taxonomy, behaviour, conservation," as per the AICTE.

Congratulations!

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Besides students pursuing their Bachelors and Masters degrees in life sciences, the course also has target groups of those who want to explore ornithology as a career option and birdwatchers who wish to expand their understanding of birds.

Mousumi Ghosh of Nature Conservation Foundation, Mysuru, Manjari Jain of IISER Mohali, R Jayapal of Salim Ali Centre for Ornithology and Natural History, Coimbatore, Anand Krishnan of IISER Pune, Umesh Srinivasan of IISc Bangalore and V V Robin of IISER, Tirupati are among resource people who will serve as faculties for the course.

9/14/22, 11:20 AM

Expert talks about immune response of plants - Times of India

Printed from

THE TIMES OF INDIA

Expert talks about immune response of plants

Sep 28, 2021, 04:10 AM IST

Shimona.Kanwar@timesgroup.com

Chandigarh: On Monday, the foundation day of IISER Mohali, a keynote lecture on "How do plants ward off pathogens?" was delivered by Prof Ramesh Sonti at IISER Tirupati.

The professor and his group have been studying how plants mount immune responses and how microbial pathogens modulate host innate immunity using the interaction between rice and the bacterial pathogen, *Xanthomonas oryzae* (Xoo), which causes a serious rice disease. By understanding the population structure of Xoo, they have identified rice resistance genes that are effective against Xoo strains in India. Three of these resistance genes have been pyramided into a commercially important rice cultivar, which is now resistant to Xoo and is in commercial cultivation in farmers' fields in our country.

Congratulations!

You have successfully cast your vote

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The team of researchers had developed an improved rice variety which was resistant to the bacterial blight which is commonly found in Punjab. "We developed resistance genes which are a fine layer of the plant immune system. This work was in collaboration with the Indian Institute of Rice Research. With that institute, we set out to understand genetic diversity of pathogens in India. We collected bacteria from different parts of India. Three resistance genes were found to be effective against Indian strains of Xoo which were introduced into Samba mahsuri—a rice variety— and we came up with these high-yielding blight resistance varieties," said Prof Ramesh.

Printed from
THE TIMES OF INDIA

IISER bags gold medal at iGEM competition

TNN | Nov 10, 2021, 04:00 AM IST

Tirupati: The team of the Indian Institute of Science Education and Research (IISER) - Tirupati, bagged gold medal at the international genetically engineered machine (iGEM) competition for the third consecutive year, scoring a hat trick win in the competition.

In a statement released on Wednesday, the IISER - Tirupati stated that the project OviCloak, a novel contraceptive for uterus owners, was also nominated for seven track awards, the highest number of nominations for any Indian team in the history of iGEM.

The team was nominated as best in various categories including new application, safety and security, wiki, education, inclusivity, integrated human practices and sustainability. The OviCloak project is aimed at genetically modifying the commensal bacteria of the fallopian tubes to produce an ovum-specific contraceptive molecule in a regulated manner.

Congratulations!

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This is a non-hormonal approach to the spectrum of long-acting reversible contraceptives. The institute said it will continue to spread the acquired knowledge to make the society a better place to live in.

THE HINDU

MENU

HOME NEWS OPINION BUSINESS SPORT ENTERTAINMENT CROSSWORD SCIENCE

STATES ANDHRA PRADESH KARNATAKA KERALA TAMIL NADU TELANGANA OTHER STATES

NEWS STATES ANDHRA PRADESH

ANDHRA PRADESH

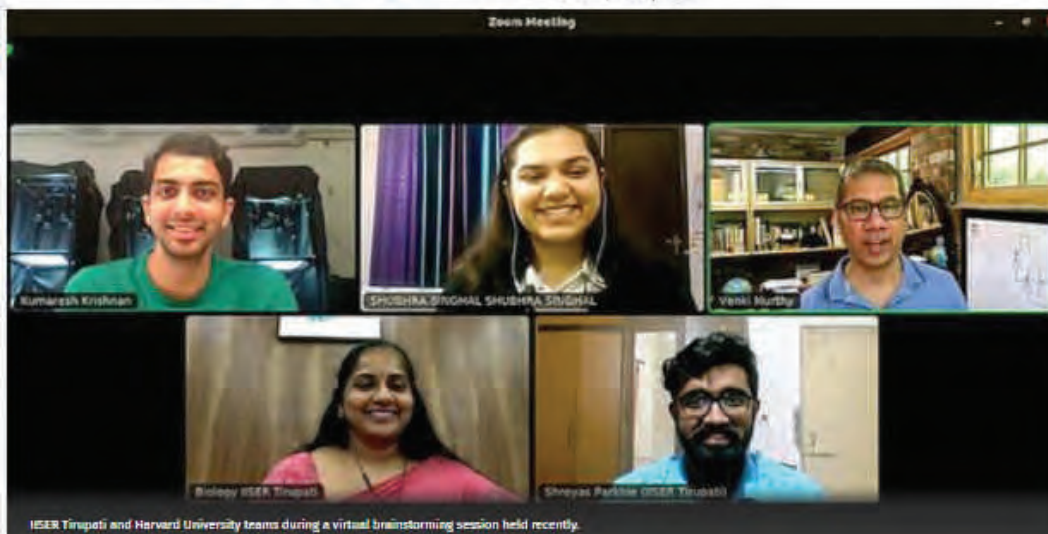
IISER students collaborating with Harvard to fight anaemia



A.D. Rangarajan

TIRUPATI, AUGUST 02, 2021 (HINDU)
UPDATED: AUGUST 02, 2021 06:04 (IST)

SHARE ARTICLE



HANS NEWS SERVICE
RAJAMAHENDRAVARAM
(EAST GODAVARI DISTRICT)

WITHOUT birds, the environment and human life would be in jeopardy, hence it is the responsibility of human beings to protect the birds, warned Jyoti Rajasekhar, Bird watcher and Citizens Science Coordinator at Indian Institute of Science Education and Research (IISER), Tirupat. On Friday evening, he briefed Forest Section and Beat officers undergoing training at AP State Forest Academy on the condition of birds, say, life, and so on. Bird watchers and environmentalists are collecting data on birds in areas with good connectivity, he said and stressed on the need to collect data on birds species in forest, their numbers, and their life. He said this work is only possible for Forest Beat officers and section



ISER Citizen Science Coordinator B Rajasekhar speaking at a training session for trainees at Forest Academy in Rajamahendravaram on Friday

tion officers, who perform duties in forest. They make it possible by developing an interest in birds and observing them daily.

He said that birds evolved from reptiles just as man evolved from monkeys. Rapasekhar believed that dinosaurs became the source of birds that became extinct a few million years ago on earth. He noted that every day humans are destroying bird habitats, which is having a detrimental effect on the environment.

అటవీ ప్రాంత శిక్షణకు ఐదుగురు ట్రైన్‌లు

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ఉదతపర్తి అటవీ ప్రాంతాన్ని పరిశీలిస్తున్న ఏపీ ఫారెస్ట్
అథారిటీ డైరెక్టర్ జేఎస్ఎస్ మూరి తదితరులు

వచ్చారు. మీరికీ ఉదయవల్లి ఆటవీ ప్రాంతంలో వన్యప్రాణం ఆవాసాలు, వాటిని ఏ విధంగా రక్షించాలి అనే విషయాలపై శ్రద్ధ ఇచ్చారు. ఆటవీ ప్రాంతంలో ఉన్న పక్షులు, వాటిని ఎలా గుర్తించాలనే విషయాలూ కూడా తెలియపరిచినట్లు పోలవరం ఆటవీకాద రేంజ్ అధికారి ఎన్.రామచంద్రా తెలిపారు. మీరు కొన్ని రోజులు రేంజ్ వసతిలోని ఆటవీ ప్రాంతంలో శ్రద్ధ పాందుతారని పేర్కొన్నారు. ఇంజనీరింగ్ కో-ఆర్డినేషన్ లాంజ్ మేజర్, ఏపీ పాలెస్ అకాడమీ ఎఫ్ఆర్ఆర్. ఎంపీ వీఎస్ మూర్తి, సీబిఎంబీ పోలీస్ అధికారులు.

ఇదొకప్పుడు కులం వరకొస్తూ ఉన్నది. అలాగే సైన్స్ ప్రాజెక్టు లో పక్కలను తిక్కా చీస్తున్న సెటిజన్ గ్రూపులు



ದಿಗ್ಗಿಲು ಲೆಕುಂದಾನೆ..

**సైంటిస్ట్
కావచ్చు..!**

అనుభవం రేపానుభవం సాధించిన సైన్యం

[illegible]

చురుక్కా పోల్సినారి

తెలుగు రాష్ట్రాల అభివృద్ధికి శతవేదికగా నిలిచి ఉన్నాడు. దీనిపై రాజీవ్ జాతీయవాదాన్ని అవలంబించి, పిడికెక్కిన పూజాత్మక చర్యలు చేపట్టడం అమానుషం. సామర్థ్యం తెలియ రాష్ట్రాల్లో ప్రజలకిగా ఉంది.

- మహాత్మా జావర్, సెంటర్

బర్ బాంట్ ఇంటియా, నీబిఎచ్ వాచ్ నిర్వహకుడు

సైన్స్ ప్రాజెక్టులు
నిర్వహిస్తాన్న తిరుపతి
ఐఐఎస్ఆర్

[illegible]

పరిజ్ఞానాన్ని పెంచుకోవచ్చు

సిద్దిబేట్ పైన్స్ ప్రాజెక్టులో పొర్లొవడం ద్వారా మత్స్యకాశాస్త్రి పెంచుకోవచ్చు. నక్షత్రశాస్త్రం పట్లనే భయం, పొర్లొకోవాలంటే అర్థం వాటినిగల వంటిది పొర్లొకో అంటేగొప్పట్లు. సిద్దిబేట్ హాటెలు, ప్రియంట్ల వ్యాధి దామిడ్లలో గొప్పనే మత్స్యకం ఈ అనికోవడం ద్వారా విజయవంతం అవుతానని అంటుంది.

- రాజశేఖర్ బండి, సిద్దికాన్ సిద్దిగ్, తరువతి వసుధేశ్వర

మధ్యవారం
15 డిసెంబర్ 20

15 دسامبر 2021

ఆంధ్రప్రభ

07

www.prabhanews.com egap@prabhanews.com indiaaheadnews.com

సైన్స్ తో సుస్థిర భవిష్యత్తు..



పాఠశాల పరిసరాల్లోని పక్షులు, చెట్లను పరిశీలిస్తూ, విద్యార్థులు

[illegible]

అనుసరణ పాఠశాల వివిధాల్లోని
జీవవిద్య, వైద్యవిద్య, మేధావీ అంటిని
ప్రతిరోజు వీటి సమాచారాన్ని పేరరందాన ప్రస్తుతం
వీటి వారి ప్రాజెక్టు కార్యక్రమ ప్రారంభమందు
అవారు మీ చుట్టూ ఉన్న వైద్యమందు ప్రాజెక్టు

[illegible]

APPENDIX



- Accounts

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ACCOUNTS

Indian Institute of Science Education & Research - Tirupati

BALANCE SHEET AS AT 31st MARCH 2022

Sources of Funds	Schedule	2021-22	2020-21
Corpus/Capital Fund	1	400,11,04,150	231,84,58,789
Designated/ Earmarked / Endowment Funds	2	3,34,82,354	2,23,09,439
Current Liabilities & Provisions	3	73,39,59,994	109,39,79,378
Hefa Finance Loan	3 (H)	0	42,20,63,846
Total		476,85,46,498	385,68,11,452

Application of Funds	Schedule	2021-22	2020-21
Fixed Assets	4		
Tangible Assets (A+D)		89,11,18,390	71,72,45,626
Intangible Assets (C)		1,09,26,374	43,53,101
Capital Works-In-Progress (B)		172,19,38,208	68,75,94,268
Hefa Fixed Assets (4d)	4D	117,47,47,487	119,99,41,515
Investments From Earmarked / Endowment Funds	5	3,34,82,354	2,23,09,439
Investments - Others	6	14,24,00,000	9,00,00,000
Current Assets	7	24,65,06,217	77,59,91,718
Hefa Current Assets	7A	14,43,063	28,49,43,783
Loans, Advances & Deposits	8	54,59,84,405	7,44,32,002
Total		476,85,46,498	385,68,11,452
Significant Accounting Policies	23		
Contingent Liabilities and Notes on Accounts	24		

For and on behalf of IISER Tirupati

sd/-
CMA CS Ramesh Damarla
Dy Registrar (F&A)

sd/-
Dr CP Mohan Kumar
Registrar

sd/-
Prof KN Ganesh
Director

Place : Tirupati
Date : 06-06-2022

Indian Institute of Science Education & Research - Tirupati

INCOME & EXPENDITURE ACCOUNT FOR THE YEAR ENDED ON 31.3.2022

Particulars	Schedule	2021-22	2020-21
(A) INCOME			
Academic Receipts	9	4,84,77,292	3,82,06,067
Grants / Subsidies	10	74,15,46,904	104,31,40,397
Income from Investments	11	1,97,49,789	1,20,56,579
Income from (HEFA Grant) Investments	11A	74,55,756	1,24,64,256
Interest earned	12	5,08,807	1,64,103
Other Income	13	52,05,633	81,24,050
Prior Period Income	14	96,367	78,000
Total (A)		82,30,40,548	111,42,33,452

Particulars	Schedule	2021-22	2020-21
(B) EXPENDITURE :			
Staff Payments & Benefits (Establishment expenses)	15	20,89,76,984	18,22,35,923
Academic Expenses	16	13,77,43,626	10,51,62,484
Administrative and General Expenses	17	11,61,29,985	10,18,49,926
Transportation Expenses	18	42,42,294	33,06,749
Repairs & Maintenance	19	1,74,06,994	2,37,60,994
Finance costs	20	17,308	15,767
HEFA Loan Interest / Charges	20A	2,21,33,535	5,41,40,547
Depreciation	4	12,32,86,423	11,20,93,226
Other Expenses	21	0	0
Prior Period Expenses	22	61,92,137	45,06,144
Total (B)		63,61,29,286	58,70,71,760
Balance being excess of Income over Expenditure (A-B)		18,69,11,262	52,71,61,692
Less: Transfer to / from Designated Fund		0	0
Less: Transfer to Institute Reserve Fund (Sch 9+Sch 13)		-5,36,82,925	-4,63,30,117
Less: Transfer of Interest (Sch.11 + Sch.12) (IRF- 61,64,821, Extnl Projects- 11,21,916 & MoE- 1,29,71,859)		-2,02,58,596	-1,22,20,682
Less: Transfer to HEFA Loan A/c (Sch. 3H)		-42,75,88,664	-52,50,00,000
Transfer to Capital Fund (depreciation Sch.-1B)		12,32,86,423	11,20,93,226
Over Utilization of Grant in Aid (Charged from Opening unspent balance) for Revenue Expenditure.		-19,13,32,500	0
Under Utilization of Grant in Aid for Revenue Exp. (Sch.3C)		0	5,57,04,119

For and on behalf of IISER Tirupati

sd/-
CMA CS Ramesh Damarla
Dy Registrar (F&A)

sd/-
Dr CP Mohan Kumar
Registrar

sd/-
Prof KN Ganesh
Director

Place : Tirupati
Date : 06-06-2022





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