MANIPAL
ACADEMY of HIGHER EDUCATION
(Institution of Eminence Deemed to be University)

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NISARGA

Newsletter from
Manipal Centre for Natural Sciences

Vol – I | January 2022 | Issue – I

Vice Chancellor's Message

I welcome the initiative of MCNS to start a newsletter. I wish and hope it serves the intended purpose!

MCNS being an 'all-research' Centre, and a Centre of Excellence, the expected targets and quality are among the highest. The vibrant teams of researchers from various branches of natural sciences, and good research students, though small in number, have been doing well, and show potential to do more. Excellence in research is achievable not just through investigations, but a lot through interactions, dissemination, and teaching. Periodical release of newsletters serves the purpose of briefly communicating the Centre's status, strength, activities, and targets to the world, thereby gaining contacts, feedbacks, suggestions, and also new directions. MCNS is a Centre, in MAHE, that realises its responsibility to grow in excellence up to its potential, and this newsletter initiative is among the many steps it pursues. MAHE appreciates and supports this initiative, and I am sure this would enhance the Centre's global visibility and growth.

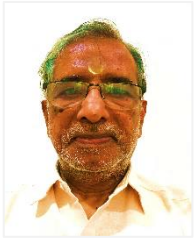
Good luck MCNS!

Lt. Gen. (Dr.) M. D. Venkatesh,
Vice Chancellor, MAHE

In this Issue

Editor's Voice

Look up or look down! It is an area of research to MCNS, i.e., the Manipal Centre for Natural Sciences, a Centre of Excellence in MAHE, that specialises in astronomical sciences as well as in earth sciences. Though the Centre has been growing, with significant and commendable ups, and some downs too, through the past decade, publication of its newsletter materializes only now, this being the very first issue. The publication of a newsletter was felt necessary, not just to publicise or list out the achievements and activities of the Centre, but to communicate briefly and periodically with other scientists in India and abroad, so as to enhance scientific relationships. The earnest expectation is that such relationships would encourage exchange of thoughts amongst the scientists, and also could inspire students and novices towards research in natural sciences. MCNS presently considers itself small with respect to manpower strengths, but the quality and recognitions it has gained so far, are strong enough to plan towards an ambitious and steady growth in various branches of natural sciences. Hopefully, this newsletter NISARGA, will do its bit to help realise its growth efforts! MCNS is thankful to our Vice Chancellor, for his encouragement in this regard.



Dr. V. Gopalakrishnan

As you turn over, you will find a holistic description of what MCNS is up to, under *Director speaks*. The essential point to note from his brief account is that MCNS is an 'all-research' Centre, with all its activities, including academic and co-curricular ones, being research-oriented. The present emphasis at the Centre includes to identify research minds among young graduates and below, support them, teach them and train them to bring out their talents in systematic pursuit of scientific research.

The foremost occupant of the sky is, undoubtedly, the sun. Dr. Sreejith P, a solar physicist, having intensive collaborations with the Inter-University Centre for Astronomy and Astrophysics (IUCAA), Pune, writes on Aditya-L1, India's first dedicated scientific mission to study the sun, under *Scientific Article*.

The business of scientific research is not bounded by reading books and journals and publishing in books and journals. It, in principle, rests on extensive and intensive interactions, by all means, with people wherein the quest for knowledge thrives. MCNS management has a panel of *Advisors*, who help in strengthening the Centre for its purpose. The Centre is in continual touch with internal and external expert scientists, invites them for talks and discussions. The experts from the Centre also visit, on invitation, other institutions, for sharing ideas and experiences gained. A part of such interactions, mainly with students, is accomplished through our Dr. T.M.A. Pai Science Outreach programs, which include planetarium shows, certificate courses, special lectures, and so on. Details of such interactions during the recent past are listed in this issue.

The research activity is complemented by teaching. As seen under *Director speaks*, the Centre's academic program includes guiding students with Master's degree as well as those with Bachelor's degree, to Ph.D. Plans to take even those inquisitive students, who have finished their school-finals, viz. 10+2, into this program. The annual Summer Research Internship (SRI) program of MCNS is a popular program, wherein selected interns experience doing fundamental research, practically all aspects of it, in 6 weeks. The recent details are also given herein in a nutshell.

MCNS is in its expansion phase, to strengthen its scientific manpower and research facilities; hence its activities will multiply. I will have to write much more than now, when I meet you through the next newsletter of ours!

MCNS wishes mankind to be free from threats of any kind! Jai Hind!

Dr. V. Gopalakrishnan, Editor, NISARGA

Director Speaks

It gives me immense pleasure to present the first newsletter of the Manipal Centre for Natural Sciences – NISARGA, featuring the activities and events of the Centre for the year 2021. I am happy that, in spite of several hurdles and restrictions due to Covid-19 pandemic, we had a decently productive year.

Dr. M. Prithviraj, (I/C) Director, MCNS

MCNS was established as an "all-research" Centre by MAHE in the year 2012. Since then, the Centre has been striving to promote fundamental research in the forefront areas of natural sciences. The Centre's academic and research programs are all aimed at strengthening independent and creative thoughts essential for scientific pursuit. Building on its core strength in physics, MCNS has expanded to include, earth, planetary and biological sciences and chemistry, as part of its ambitious mandate.

Till recently, MCNS had a regular Ph.D. program, where only M.Sc. degree holders with excellent academic record were admitted. But, from the current academic year, an 'Integrated Ph.D.' program is being offered, wherein the Bachelor's degree holders who possess meritorious academic credentials and have motivation to pursue a career in fundamental research, are being admitted to do their Master's and proceed to pursue research, leading to a Ph.D. degree. The main reason for initiating this program is to enroll students at a younger age so that sufficient time could be spent on imparting conceptual understanding in the chosen discipline, to incorporate inter-disciplinary elements, and to expose them to a variety of scientific skills and computational methods that are useful to them to pursue research in his/her chosen area of science.

Here, I must thank the MAHE administration for their excellent guidance and speedy administrative clearances, that was needed to upgrade the existing 'M.Sc. by Research' program, in Physics, to 'Integrated Ph.D.' program and to introduce the same from the current academic year. Presently, MCNS is aspiring to introduce a Master's program in 'Evolutionary Biology' and an Integrated M.Sc. program in the 'Earth and Planetary Sciences'. Work in this direction has been initiated.

Eminent scientists, in the areas of Physics, Earth Sciences and Biological Sciences, have been taken on board the 'Advisory Group' to help in orienting and expanding the Centre's academic and research programs.

The 'Summer Research Internship' program, a flagship annual program of the Centre, is being offered since the year 2014. The primary objective of this program is to spot young and promising students showing keen interest to learn the nuances of research, and to expose them through a 6 week's residential program, on all aspects of the life cycle of academic research, right from identifying a problem, designing the experimental approach, finding an acceptable solution to the problem, till the dissemination of the results through written, oral and poster methods. In the year 2021, due to the Covid 19 travel restrictions, this program could not be organised on residential mode, but we innovated and executed the program in a virtual classroom environment. 16 interns, drawn from reputed institutions spread over India were successfully mentored under this program. The success of this program is largely attributed to the committed faculty and research scholars of the Centre, who extended their guidance to the participating students, even much beyond the office hours, when requested. At the culmination of the program, participating students were provided with an opportunity to share their research findings through a poster competition, that was adjudged by a panel of judges from other sister institutions and the three best presentations were awarded each with a certificate of merit and a prize.

Further, MCNS organised several invited talks by leading experts from India and abroad on a variety of topics. Short certificate courses in Cosmology, Observational Astronomy, and Radiation Awareness were also offered during 2021. The details are given in this Newsletter.

Dr. M. Prithviraj
(I/C) Director, MCNS

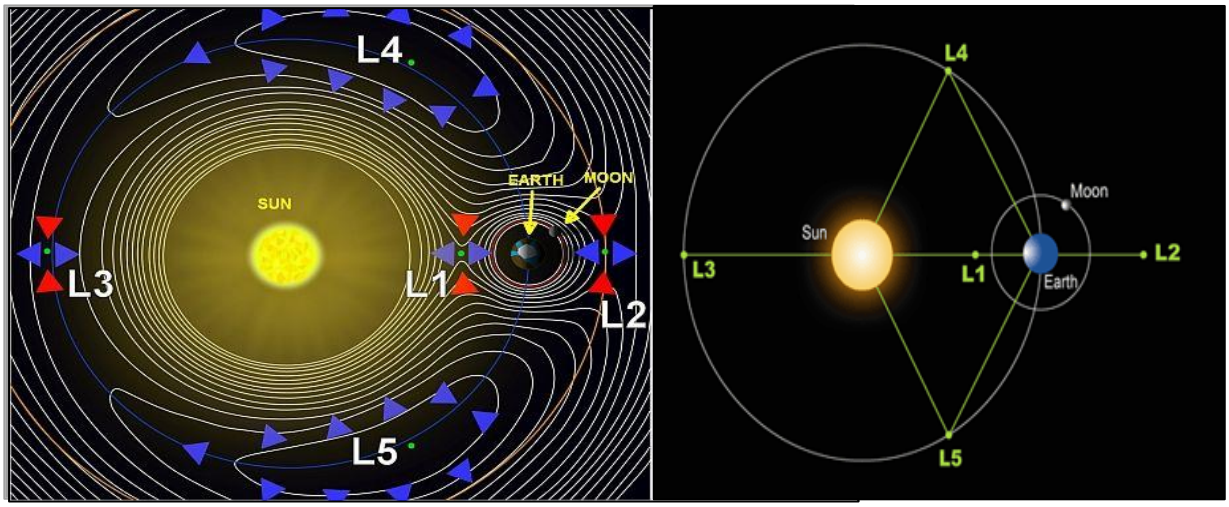
Scientific Article

Aditya-L1: India's first dedicated mission to study the Sun.

Dr. Sreejith P

The Sun is a normal, middle-aged star in the universe. For us, the Earthians, the Sun is not just another star in the neighborhood but a very special star. The Sun provides almost all the energy required for our survival, let it be in the form of energy to plants for photosynthesis or in the form of heat to keep our planet warm and inhabitable. Hence, from time immemorial, our ancestors were enthusiastic about studying the Sun and different activities happening on the Sun.

'**Aditya-L1**' is a satellite-based space observatory to study the Sun and the space weather near the Earth. Aditya-L1 is the first dedicated mission to study the Sun from the Indian Space Research Organisation (ISRO). The observatory satellite will be placed at a halo orbit around the first Lagrangian point L1 in the Sun-Earth system. Lagrangian points are those points where the gravitational potential goes to a minimum, and hence, form a good place to park satellites. Placing a solar observatory at the L1 point also gives us a chance to observe the Sun 24x7 without any eclipse time gaps. Aditya-L1 mission is special and challenging, as India will place a satellite at L1 for the first time in the history of Indian space exploration.



Schematic view of the Lagrangian points in the Earth-Sun system
(Image Courtesy: Wikipedia)

Aditya-L1 is a multi-instrument observatory with seven payloads, out of which four are remote sensing instruments to study the Sun, and three are instruments to study in-situ plasma and magnetic field at the L1 point. The seven instruments are:

1. *Visible Emission Line Coronagraph (VELC):* This telescope will be studying the corona of the Sun, in the visible and infrared spectral regions, by creating an artificial total solar eclipse. The primary science goals of VELC are to study the solar corona and coronal structures and to estimate parameters like velocity, density, temperature, magnetic field, etc. VELC is expected to throw more light on the physics of the origin and early evolution of Coronal Mass Ejection (CME).

2. *Solar Ultraviolet Imaging Telescope (SUIT):* As the name suggests, SUIT will image the Sun in the near Ultra-Violet (NUV) spectral range (200nm - 400nm) in high resolution and high contrast. This will provide near simultaneous coverage of the solar atmosphere from the photosphere to the upper chromosphere. SUIT is also intelligent to detect Solar flares automatically, and hence it will be able to observe the flares from their early phase of evolution. Since UV radiation is known to directly affect the Earth's upper atmosphere, including its chemistry, SUIT observations will help study the Sun-Earth connection and its effects on Earth's climate.

3. Solar Low Energy X-ray Spectrometer (SoLEXS)

4. High Energy L1 Orbiting Spectrometer (HEL1OS)

SoLEXS and HEL1OS together cover a broad range of X-rays, from 1 keV to 150 keV in high resolution and high sensitivity. The study of the Sun in X-rays will lead to further our knowledge regarding the origin and evolution of solar flares, solar plasma properties like temperature, density, etc., and elemental abundance in the solar corona.

5. Aditya Solar Particle Experiment (ASPEx)

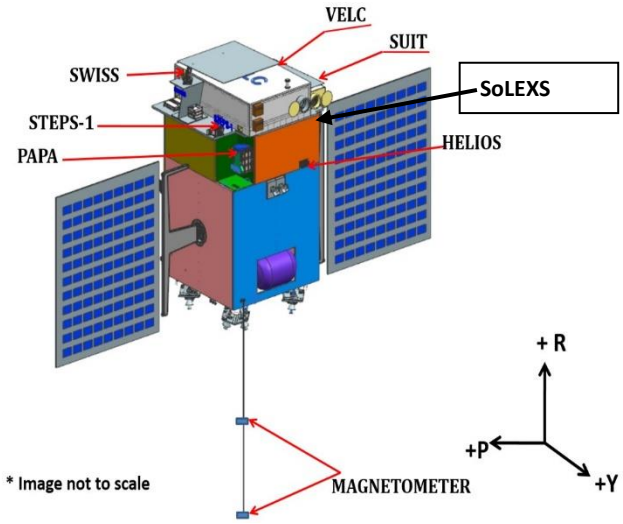
6. Plasma Analyser Package for Aditya (PAPA)

ASPEx and PAPA are two in-situ plasma analyzing instruments to study the properties of particles at the L1 point. Combined, these two instruments will give a clear picture of the plasma and other energetic particles reaching at L1, from the Sun on their way to Earth.

7. Magnetometer: Aditya-L1 also has two magnetometers on a boom, which will measure the magnetic fields at the L1 neighbourhood.

Aditya-L1 is in the final stages of completion and is expected to be launched in 2022. This mission will be an excellent opportunity for astrophysics enthusiasts and students to study the Sun in detail and understand the physics of the Sun.

Dr. Sreejith Padinhatteeri,
Assistant Professor, MCNS.
(Project Scientist, SUIT on Aditya-L1)



Deployed view of Aditya-L1 Satellite
(Image Courtesy: ISRO)

Academic Programs in MCNS

Program Name	Eligibility	Period	Subjects	Comments
Current Programs				
Regular Ph.D.	M.Sc.	4 years	(i) Astrophysics (ii)Nuclear Physics.	Chemistry, Earth & Planetary Sciences, and Evolutionary Biology, will be available soon.
Integrated Ph.D. (M.Sc. + Ph.D.)	B.Sc.	5.5 years	(i)Astrophysics (ii)Nuclear Physics.	
Proposed Programs				
M.Sc.	B.Sc.	2 years	Evolutionary Biology	Proposed from the Academic year 2023-24
Integrated M.Sc. (B.Sc. + M.Sc.)	Plus 2	5 years	Earth and Planetary Sciences	

Advisors to MCNS

MCNS is proud to have the following eminent scientists as its advisers.

Prof. Ajit Kembhavi

Former Director, The Inter University Centre for Astronomy & Astrophysics (IUCAA), Pune.
Vice President, International Astronomical Union.

Dr. Amit Roy

Former Director, The Inter University Accelerator Centre (IUAC), New Delhi.

Dr. P. Sreekumar

Former Director, Indian Institute of Astrophysics (IIA), Bangalore. Former Director, Space Science Programme office, ISRO – DOS.
Satish Dhawan Professor, ISRO-DOS

Prof. M.K. Janarthanam

Formerly Dean, Faculty of Life Sciences & Environment,
Professor of Botany.
Officiated as VC Goa University.

Prof. M. L. Khan

Professor of Botany & Director of Academic Affairs, Dr. Harisingh Gour Central University, Sagar, MP.
Expert Committee member of PSA, Govt. of India.

Prof. L. S. Chamyal

Former Head, Dept. of Geology, MS University, Baroda.

Prof. Vishwas Kale

Former Professor and Head, Dept. of Geography, Pune University.

Dr. G. R. Ravindra Kumar

Scientist G, National Centre for Earth Science Studies, Trivandrum.

Infrastructure

The following infrastructural facilities in MCNS are worth special mention:

- **'Shakti'**, A Computer Cluster with Parallel Processing capability.
- A neutron source laboratory with appropriate accessories like detectors/counters
- A Table-Top Accelerator – for demonstration and teaching purposes.
- A planetarium – for outreach and for sensitizing students and public on importance of scientific research.
- An auditorium
- A dedicated library.

Table-top accelerator in MCNS

MCNS Auditorium

Summer Research Internship (SRI)

SRI is an annual event in MCNS organised for about 6 weeks during June – July. It is intended to introduce young participants to the nuances of fundamental research, from conceiving a scientific problem to its solution and formal publication. Each intern works with his/her mentor on a specific research project, mostly on a contemporary topic. It includes seminar presentations, and report writing. Participants receive certificates and three best poster presentations receive prizes.

SRI-2021 was organised as an Online event, on account of the pandemic-related restrictions, though SRI is generally an in-Campus event. Research projects were offered in (i) Computational reactor physics, (ii) Evolutionary Botany, (iii) Theoretical Physics, and (iv) Observational Astronomy. 85 applications were received from 42 Institutes from 12 states, as indicated in the map, and 16 interns were selected. During the event, there were 5 educative talks given by external experts. 3 best-poster prizes were given. [A few notable institutions that participated: MIT Manipal, IISER Kolkata, IISER Pune, IISER Berhampur, IISER Mohali, IIST (TVM), NITK, BHU, St. Xavier College Kolkata, Fergusson College, Pune, Central University of Tamil Nadu, Calicut University, Goa University, Jamia Millia Islamia, Mangalore University, NIE Mysuru.]

Short Certificate Courses

This could generally be for 1 or 2 weeks. It includes lectures, and home assignments, and involves specific skill development as take-away. The 1-week certificate courses organised in 2020-21 are given in the table. Each course was attended by 20-30 participants from all over India. The courses on Astrophysics and Cosmology had a few participants from abroad. Certificates were issued to participants who attended the entire course chosen and completed the assignments.

Title	Start date	Instructor
Chemistry of elemental and isotopic distributions on Earth and Planetary Surfaces	22 Oct 2020	Dr. Suranjan Shill *
Frontiers in Astro-particle Physics and Cosmology	02 Nov 2020	Dr. Kazuyuki Furuuchi
Contemporary topics in astrophysics from an observational perspective	09 Nov 2020	Dr. Debbijoy Bhattacharya
Neutron Physics and applications to next generation reactors	16 Nov 2020	Dr. V. Gopalakrishnan
Paleo-botanical evidence and evolutionary trends in plants	23 Nov 2020	Dr. Vivek Pandi
Neutrino physics and quantum field theory	30 Nov 2020	Dr. Kolahal Bhattacharya *
Earth's Landforms & their Evolutionary Mechanisms	07 Dec 2020	Dr. M. Prithviraj
Exotic Astrophysical Objects	05 Apr 2021	Dr. Debbijoy Bhattacharya
Key Problems in Particle Physics	19 Apr 2021	Dr. Kazuyuki Furuuchi
Radiation Safety and Awareness	23 Aug 2021	Dr. K. V. Subbaiah

* Lectures without certificates.

Science Outreach Activities

MCNS engages in outreach activities through the following:

(1) **Dr. T.M.A. Pai Planetarium:** MCNS is in charge of this planetarium, which helps taking science to general public and more specifically to school students. There are regular shows in English and Kannada. Its activity has been presently limited due to the pandemic-related restrictions. However, its infrastructure has been recently enhanced and is ready to beam its shows, when approved.

(2) **General Radiation Awareness and Safety Program (GRASP):** MCNS has a few experimental facilities involving very low-level radioactive emissions. The safety precautions, as prescribed by the Atomic Energy Regulatory Board (AERB), are adhered to. This annual program, as mandated by AERB, is to educate and certify employees and others, on the awareness to natural and manmade radiation effects, and the safety precautions and practices. This week-long program generally is scheduled in February, and the awareness is created through, lectures, screen-shows, and practical demonstrations. The level of awareness gained is verified through a simple examination, and certificates issued. The Radiological Safety Officer (RSO) is in charge of this program, and the awareness certificate is mandatory to all the MCNS employees. This program is also offered to others through the short certificate course as mentioned elsewhere herein.

(3) **Science Week:** This is also an annual program conducted for a week around February 28, in memory of Indian Nobel Laurette Sir C.V. Raman. Special lectures, posters, science-based film shows, special planetarium shows, etc., feature in this program, mostly oriented to students' interests. In order to avoid crowding the last Science-Week celebration was done online through the following special talks:

Science-week lectures		
• Dr. Debbijoy Bhattacharya,	"Exploring our Universe",	24 Feb 2021.
• Dr. Vivek Pandi,	"The Science of Plant-Animal Interactions",	25 Feb 2021
• Dr. V. Gopalakrishnan,	"Fast Reactors: Why & How!",	26 Feb 2021.
• Dr. Kazuyuki Furuuchi,	"Elementary Particles",	28 Feb 2021.

(4) Students' Clubs

There are 3 clubs viz. (i) the **Reading Club,** (ii) the **Nature Club,** and (iii) the **Movie Club**, all managed by the research students of the Centre, to widen the scope of scientific learning and appreciation. The clubs also help interdisciplinary exchange of thoughts.

Reading Club: This is to inculcate the habit of appreciating and grasping the essence of the writings by eminent writers. A paper or a chapter of such eminence is given a week in advance, and during the club meeting, the salient points are discussed/argued upon, amidst MCNS researchers. The following formed the reading materials during the recent Reading club meetings:

- Lectures from "The Character of Physical Law" by Richard Feynman. (02-01-2021)
- "Origins of modern human ancestry". Published in Nature, February 2021, Vol. 590, 229. (06-03-2021)
- "COVID-19 vaccines: where we stand and challenges ahead". (03-04-2021)

Nature Club: It aims for enhancing students' understanding about the environment. Nature club activities not only help appreciating the wonderful flora and fauna around us, but also to emphasise the need of their conservation. The activities generally include field visits, lectures by invited experts, and documentary shows. The following are the recent events:

- "Introduction to the world of Algae". Talk given by Mr. Elaya Perumal, Scientific officer at Annakkili Amma Research Institute (AARI). (13-03-2021).
- "Genetics and behavior". Talk given by Dr. Salmataj S. A., Asst. professor, Department of Biotechnology, Manipal Institute of Technology, Manipal. (10-04-2021).
- "Revisiting Ancestry and Ancestry Informative Markers in the Genomic era". Talk given by Dr. Ranajit Das, Assistant professor at Yenepoya Research Centre, Yenepoya University, Mangalore. (08-05- 2021).
- "Amazing world of bats". Video documentary, followed by discussions with Mr. Rahul Khanolkar, Mhadei Research Center, Belagavi, Karnataka. (13-11-2021).
- "The Unsung Estuary of Mulki" a documentary by Dhyan C K and Sathwik P S., followed by an interactive session with the "Wild DK" team. (15-12-2021).

Movie Club: This club screens inspiring documentary movies related to scientific discoveries and discoverers. Such documentaries not only bring out the wonderful moments of various discoveries, but also the hardships encountered during the endeavours. The following are the movies recently screened:

- Our Planet: Episode - 3 Jungles (28-08-2021).
- Episode 1- Light [from the documentary series Light and Dark] (25-09-2021).
- Comet Catcher: Rosetta Landing (23-10-2021).
- The Genius of Marie Curie (27-11-2021).

Expert Talks

A. Talks at MCNS by invited experts

- Dr. William F Laurance, Australian Laurette, James Cook University, Australia, "Environmental Synergisms and the Fate of Nature", 22 May 2021 (MCNS - The World Biodiversity Day Celebration special lecture)
- Prof. Jeong-Hyuck Park, Department of Physics, Sogang University, Korea, "How Many is Different? Question of Emergence and Answer from Ideal Bose Gas", 15 Jun 2021.
- Prof. Vishwas S. Kale, Former Head & Professor, Department of Geography, SP Pune University, Pune, "Sahyadri: The Benevolent Mountain (The morphology and geological history of the Western Ghat", 18 Jun 2021.
- Prof. Amit Roy, Former Director, Inter-University Accelerator Centre, New Delhi, "Nuclear Physics: Past, Present and Future", 03 Jul 2021.
- A team of experts from "OUR PSYCHE", "Importance of mental health and well-being", 05 Jul 2021.
- Dr. Vinay Kashyap, Astrophysicist, Centre for Astrophysics, Harvard & Smithsonian, "X Rays from Stars", 10 Jul 2021.
- Dr. Sreejith Padinhatteeri, Project Scientist, The Solar Ultraviolet Imaging Telescope (SUIT) onboard Aditya-L1 Solar Observatory, IUCAA, Pune., "Aditya -L1 - India's First Dedicated Mission to Study the Sun", 16 Jul 2021.
- Prof. Francois Munoz, Interdisciplinary Physics Laboratory, Grenoble Alpes University; Saint-Martin-d'Heres, France, "Island biogeography, metapopulation and conservation", 01 Sep 2021.

B. **Talks given at other institutions by MCNS experts on invitation**

- Dr. Vivek Pandi, "What we can do for the environment", World Environment Day special lecture, 07 Jun, 2021.
- Dr. Vivek Pandi, "Ecology and biodiversity of climbing plants", 'Know Our Environment', Tamil Nadu, India, 24 Jul, 2021.
- Dr. Debbijoy Bhattacharya, "Study of active galaxies in the Fermi era", 7th Southern Regional Astronomy Meeting, 08-10 Sep, 2021.
- Dr. Kazuyuki Furuuchi, "Large-field inflation models from gauge theories with (deconstructed) extra dimensions", 7th Southern Regional Astronomy Meeting, 08-10 Sep, 2021.
- Dr. Vivek Pandi, "Global biodiversity and conservation: are we heading towards the sixth major extinction", Department of Geo-politics and international relations, MAHE, Manipal. 09 Nov, 2021.
- Dr. Debbijoy Bhattacharya, "Interest vs Career in Astrophysics", One Day Workshop on Modern Research Areas in Physics held at Manipal Institute of Technology, MAHE, Manipal on 16 Nov, 2021.

MCNS Library

MCNS library offers a wide range of online resources, text books and reference books, to assist fundamental research in the physical sciences, earth & planetary sciences and in scientific computations. The library also serves as a resource centre for scientific outreach with its collection of popular and educational audio-video materials and nature books collection. The digital collection could be accessed through MAHE Library portal.
MCNS Library Digital Subscription Page: https://libportal.manipal.edu/MCNS/MCNS.aspx.

People who left/joined MCNS

- Dr. Mohini Gupta, Former Director, MCNS, demitted her office, effective April, 2021.
- Sri Sachin Shet, Staff Scientist, joined the Centre in July 2021. He supports senior faculty in the maintenance and operation of the experimental physics facilities.
- Dr. S V Suryanarayana, retired Scientific Officer/H, Nuclear Physics Division, BARC, joined the Centre in November 2021, as a Consultant faculty, in the Nuclear Physics discipline. His interests are in Nuclear Physics Theory and Experiments.
- Dr. Sreejith Padinhatteeri, Assistant Professor, joined the Centre in November 2021. His research interests are Astrophysics, Solar Physics and Astronomical Instrumentation. He works closely with IUCAA and ISRO on Aditya-L1 satellite project.

Forthcoming Events

The following scientific events are in the pipeline during the next half-year.

1. General Radiation Awareness and Safety Program (GRASP): One-day course with awareness test – February 2022.
2. Science week Celebrations – February 21-28, 2022 – Theme: "**Integrated Approach in Science & Technology for Sustainable Future**".
3. Two-day online workshop on "**Methods in estimating plant diversity and distribution**" – February 14-15, 2022.
4. One-day workshop on "**Basics of Particle Accelerators, and demo with a Table-top Accelerator**", for UG & PG students – March, 2022.
5. Three-day workshop in **Astronomy & Astrophysics** – April, 2022.
6. Short certificate (one-week) courses – April/May, 2022, on specific topics (to be specified) in Astrophysics, Cosmology, Nuclear Physics, Evolution Biology, and Earth & Planetary Sciences.
7. Summer Research Internship (SRI-2022) program – A 6-week research internship for students at graduate and post graduate levels, June/July, 2022. Announcements will be made in February/March, 2022.

Awards and Recognitions

- Dr. Debbijoy Bhattacharya, Associate Professor, MCNS, is honoured with 'Visiting Associateship' at Inter-University Centre for Astronomy and Astrophysics (IUCAA), Pune University Campus.

- Dr. Debbijoy Bhattacharya, Associate Professor, MCNS, is a Member of Science Working Group (SWG) for XPoSat Mission.

- Dr. Vivek Pandi, Assistant Professor, won the second prize in photography competition organized by the MSLS, MAHE, on the eve of the World Fungus Day celebration, for the adjoining photograph.

Observance of Commemorative Days

The following events were held to observe commemorative national days:

1. Observance of National Independence Day 2021 in MCNS, under the theme: **"Science towards strong India".**
2. Commemoration of the 400th Birth Anniversary of Shri Guru Tegh Bahadur Ji, special lecture on "**Remembering Shri Guru Tegh Bahadur Ji on his 400th birth anniversary"**, by Ms. Sanna Gulati, Ph.D. student, MCNS.
3. Observance of Republic Day 2021; informal theme: "**Introspection on individual and collective contributions to the Nation building**".

Publications

1. Ashwini Udupi, Pramoda Kumara Shetty, Priyada Panikkath and Pradip Kumar Sarkar (2021). Comparison of transportable neutron sources for quantitative elemental analysis using prompt gamma neutron activation technique. *Radiation Physics and Chemistry,* 180, 1-10.

2. Ashwini Udupi, Pramoda Kumara Shetty, Priyada Panikkath and Pradip Kumar Sarkar (2021). Comparison of different methods of estimating the effective dose and the ambient dose equivalent for neutrons from measured prompt gamma intensities. *Nuclear Instruments and Methods in Physics Research A,* 993, 1-11.

3. Cheng-Yang Lee. Fermionic degeneracy and non-local contributions in flag-dipole spinors and mass dimension one fermions. (2021). *European Physical Journal C,* 81 (1), 1-8.

4. Sanna Gulati, Debbijoy Bhattacharya, Subir Bhattacharyya, Nilay Bhatt, Stalin C. S. and Agrawal V. K. (2021). Multiwavelength monitoring of NGC 1275 over a decade: Evidence of a shift in synchrotron peak frequency and long-term multi-band flux increase. *Monthly Notices of the Royal Astronomical Society,* 503 (1), 446-457.

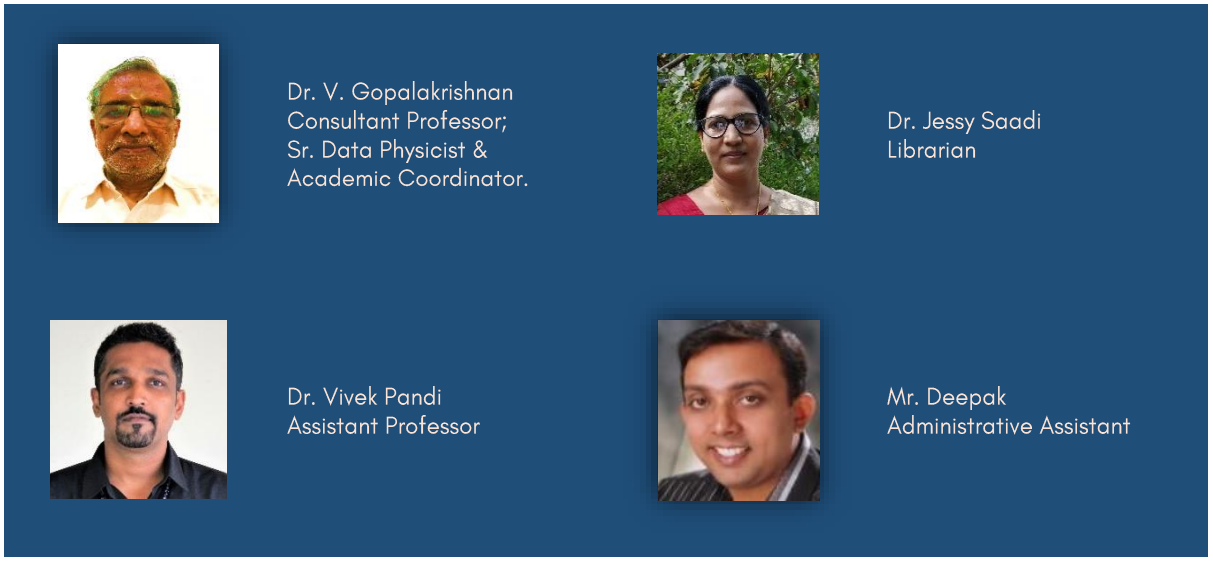
5. Subhashree Swain, Shalima P, Latha K.V.P. and Krishna B S Swamy. (2021). Hot graphite dust in the inner regime of NGC 4151. *Monthly Notices of the Royal Astronomical Society,* 503, 5877-5893.

6. Priyada Panikkath, Pradip Kumar Sarkar and Sankaranarayanan Krishnaswamy. (2021). A technique of solving an ill-posed inverse problem of neutron spectrum unfolding using a genetic algorithm search within Monte Carlo iterations. *European Physical Journal Plus, 136, 1-8.*

7. Krishna Mohana A, Debbijoy Bhattacharya, Ranjeev Misra, Subir Bhattacharyya and Nilay Bhatt. (2021). Long term multi-band monitoring of blazar 3C 66A: Evidence of thetwo distinct states with different baseline flux. *Monthly Notices of the Royal Astronomical Society*, 507 (3), 3653–3659.

8. Mohanakrishnan P., Om Pal Singh and Kannan Umasankari (editors). 2021. Physics of Nuclear Reactors. *Elsevier Inc.* [Chapter 1- Introduction & Chapter 2- Nuclear data: Authored by Dr. V. Gopalakrishnan, Consultant Professor, MCNS].

The Editorial Board



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