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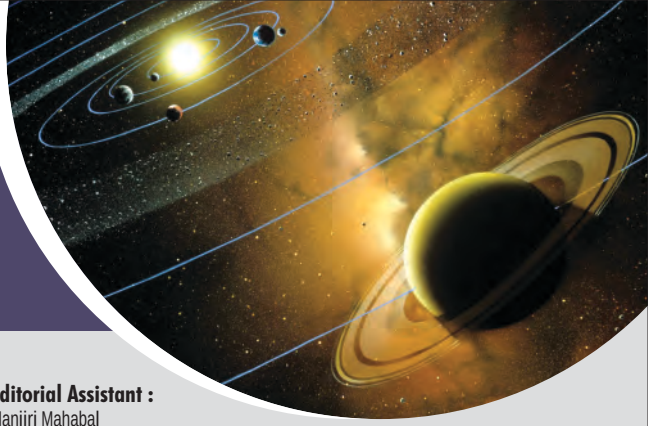

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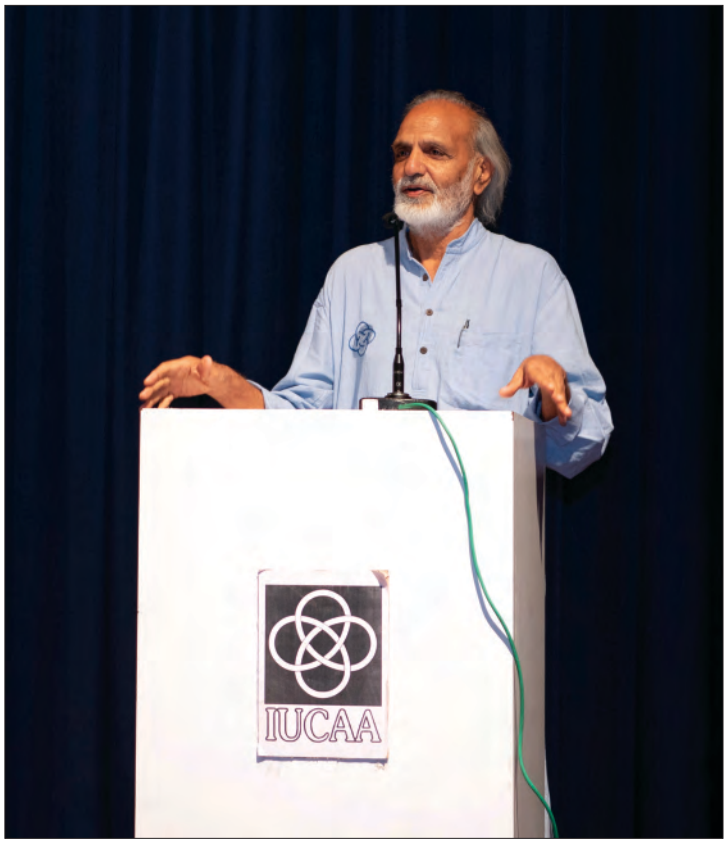
Meeting on Astronomy in Universities (IUCAA@30 + JVN@80)

Contents...

To commemorate 30 years of IUCAA, and to celebrate Professor Jayant Narlikar becoming 80 years old, a meeting was held at IUCAA during September 27 - 28, 2018, on Astronomy in Universities. The main objective of this meeting was to review the Associateship programme of IUCAA, and its impact in Indian Universities/Colleges on research and development of Astronomy and Astrophysics. The meeting was attended by several senior Visiting Associates of IUCAA from different universities, and IUCAA members. There were about 100 participants. Talks were given with emphasis on the present and up-coming national and international astronomical observatories, and the human resources required to optimally use these facilities. Several Visiting Associates shared their experiences and ideas about research and training in Astronomy at the Universities. There was a panel discussion, where members presented their own ideas, and solicited opinion from the participants to make a road map to enhance Astronomy teaching and research in universities/colleges.



In the evening of September 28, tributes were paid to Professor Narlikar by people who had been closely associated with him, and there was a special programme, ABHALALA GAWASANI ''आभाळाला गवसणी'' designed for the occasion by the director and screenwriter, Sai Paranjpye. The programme was in the traditional Maharashtrian tamasha format; a specially made video version will soon be available for viewing. There was a large crowd from Pune and far off places for this programme, and it was a nice occasion to watch. The meeting was coordinated by Ajit Kembhavi and Ranjeev Misra.

Addition to the IUCAA family

IUCAA extends a warm welcome to the new Visiting Associates of the twenty-ninth batch joining us for a tenure of three years, beginning August 2018.

New Visiting Associates

Piyali Bhar, Department of Mathematics, Government General Degree College, Singur, Hooghly.

Laxmikant Chaware, Centre for Basic Sciences, Pt. Ravishankar Shukla University, Raipur.

Shanti Priya Devarapalli, Department of Astronomy, University College of Science, Osmania University, Hyderabad.

Anoubam Senorita Devi, Department of Physics, Assam University, Silchar.

Vijayakumar Honnappa Doddamani, Department of Physics, Bangalore University, Bengaluru.

Suman Ghosh, Department of Physics, Indira Gandhi National Tribal University, Amarkantak.

Tuhin Ghosh, School of Physical Sciences, NISER, Bhubaneswar.

Rajeev Kumar Jain, Department of Physics, IISc, Bengaluru.

Jessy Jose, Department of Physics, IISER, Tirupati.

Jeena K., Department of Physics, Providence Women's College, Kozhikode.

Nishikanta Khandai, School of Physical Sciences, NISER, Bhubaneswar.

Sourav Mitra, Department of Physics, Surendranath College, Kolkata.

Kamakshya Prasad Modak, Department of Physics, Brahmananda Keshab Chandra College, Kolkata.

Uma Papnoi, Department of Physics, Kanoria P.G. Mahila Mahavidyalaya, Jaipur.

Chayan Ranjit, Department of Mathematics, Egra S. S. B. College, Medinipur.

Rathin Sarma, Department of Physics, Hojai College.

Sudhaker Upadhyay, Department of Physics, K.L.S. College, Nawada.

Bhargav Pradeep Vaidya, Department of Physics, IIT, Indore.

Extension of term to the twenty-sixth batch of Visiting Associates

Gazi Ameen Ahmed, Department of Physics, Tezpur University.

Rizwan Ul-Haq Ansari, Department of Physics, Maulana Azad National Urdu University, Hyderabad.

Shyamal Kumar Banerjee, Department of Mathematics, University of Petroleum and Energy Studies, Dehradun.

Prasad Basu, Department of Physics, Cotton University, Guwahati.

Ritabrata Biswas, Department of Mathematics, The University of Burdwan.

Debasish Borah, Department of Physics, IIT, Guwahati.

Koushik Chakraborty, Department of Physics, West Bengal State University, Kolkata.

Mamta Dahiya, Department of Physics and Electronics, S.G.T.B. Khalsa College, Delhi.

Broja Gopal Dutta, Department of Physics, Rishi Bankim Chandra College, Naihati.

Jibitesh Dutta, Department of Basic and Social Sciences, North-Eastern Hill University, Shillong.

Sarbari Guha, Department of Physics, St. Xavier's College, Kolkata.

Priya Hasan, Department of Physics, Maulana Azad National Urdu University, Hyderabad.

Joe Jacob, Department of Physics, Newman College, Thodupuzha.

Deepak Jain, Department of Physics, Deen Dayal Upadhyaya College, New Delhi.

Charles Jose, Department of Physics, Cochin University of Science and Technology, Kochi.

Minu Joy, Department of Physics, Alphonsa College, Pala.

Soumen Mondal, Department of Physics, Jadavpur University, Kolkata.

Hemwati Nandan, Department of Physics, Gurukula Kangri University, Haridwar.

Rajesh Kumble Nayak, Department of Physical Sciences, IISER, Kolkata.

Biswajit Pandey, Department of Physics, Visva Bharati, Santiniketan.

Sanjay Kumar Pandey, Department of Mathematics, L.B.S. (P.G.) College, Gonda.

Bikash Chandra Paul, Department of Physics, North Bengal University, Siliguri .

Amit Pathak, Department of Physics, Banaras Hindu University, Varanasi.

Ananta Charan Pradhan, Department of Physics and Astronomy, NIT, Rourkela.

Farook Rahaman, Department of Mathematics, Jadavpur University, Kolkata.

C.D. Ravikumar, Department of Physics, University of Calicut, Kozhikode.

Sanjay Kumar Sahay, Department of Computer Science and Information Systems, BITS- Pilani, Goa.

Prasant Samantray, Department of Physics, BITS-Pilani, Hyderabad.

Asoke Kumar Sen, Department of Physics, Assam University, Silchar.

Somasri Sen, Department of Physics, Jamia Millia Islamia, New Delhi.

Sandeep Sahijpal, Department of Physics, Panjab University, Chandigarh.

Ranjan Sharma, Department of Physics, Cooch Behar Panchanan Barma University.

Alkendra Singh, Department of Physics, Banaras Hindu University, Varanasi .

Parijat Thakur, Department of Pure and Applied Physics, Guru Ghasidas Central University, Bilaspur.

Pranjal Trivedi, Department of Physics, Sri Venkateswara College, Delhi.

Sanil Unnikrishnan, Department of Physics, St. Stephen's College, Delhi.

Welcome to . . .

Deepali Agarwal, Bhaskar Arya, Navin Chaurasiya, Piyali Ganguly, Labanya Kumar Guha, Amit Kumar, Shrabani Kumar, Anuj Mishra, Samanwaya Mukherjee, Aromal P., Divya Rana, Parisee Sunil Shirke, Kanchan Soni, and Vishal Upendran, who have joined IUCAA as Research Scholars.

Farewell to . . .

Uday Nakade, who has joined the Ludwig-Maximilian University of Munich, Germany, to complete his Masters' degree.

J.N.H.S. Aditya, who left IUCAA at the end of his tenure as a Post-Doctoral Fellow.

Prasanta Char, who also left IUCAA at the end of his tenure as a Post-Doctoral Fellow.

Welcome to . . .

Sheelu Abraham, who has joined as a Research Associate at IUCAA in September 2018. She obtained her Bachelors' (2004), Masters' (2006) and PhD (2015) degrees in Physics, all from St. Thomas College, Kozhencherri, which has been affiliated to Mahatma Gandhi University, Kottayam. Her doctoral thesis focuses on the data analysis from large-scale sky surveys using Machine Learning tools. Her current research interests are in gravitational waves and galaxy morphology studies, especially with the application of Machine Learning tools. Earlier, she was working as a Post-Doctoral Fellow in IUCAA during 2015 - 2018.

Md. Shah Alam, who has joined IUCAA as a Post-Doctoral Fellow in August 2018. He obtained BSc (2007), and MSc (2009) degrees in Physics from Aligarh Muslim University, and did PhD research work from the Centre for Theoretical Physics, Jamia Millia Islamia, New Delhi. During PhD, he worked on observational study of black hole X-ray binary systems with space-based X-ray astronomy satellites like XMM-Newton, RXTE, and Suzaku. He has studied the effect of strong gravity of stellar-mass black hole on its surrounding structures like accretion disk and corona. Currently, he has been working on the study of clumpy nature of absorber between the black hole and companion star in high mass X-ray binary systems using XMM-Newton and AstroSat data. Earlier, he was working as a Post-Doctoral Fellow in IUCAA (under AstroSat project) during 2016-2018.

Abhijit B. Bendre, who has done his Bachelors' (2008) and Masters' (2010) degrees in Physics, both from Savitribai Phule Pune University. He obtained his PhD degree from Leibniz Institute for Astrophysics, Potsdam, Germany, in 2018, during which, he worked on the simulations of ISM to understand the emergence, and geometry of large scale magnetic fields hosted by the galaxies, where he tried to explore the reaction of cosmic rays and large scale magnetic field on the growth of galactic magnetic fields. He joined IUCAA in September 2018 as a Post-Doctoral Fellow. His current research involves the investigation of turbulent transport coefficients in galactic ISM.

Savithri H. Ezhikode, who has joined IUCAA as a Post-Doctoral Fellow in August 2018. She obtained her Bachelor's (2009) degree in Physics from the University of Calicut, Kozhikode, and MSc (2011) and MPhil (2012) degrees in Physics, both from Mahatma Gandhi University, Kottayam. She did her PhD (2018) at St. Thomas College, Kozhencherri affiliated to Mahatma Gandhi University. Her PhD thesis was based on the X-ray spectral studies of Active Galactic Nuclei. She has worked on the multi-wavelength SED modelling and variability studies of AGN. Her current research work involves the observational studies of AGN using AstroSat data.

Soumavo Ghosh, who has joined IUCAA as a Post-Doctoral Fellow in March 2018. He obtained BSc (Honours) (2010) degree in Mathematics from the University of Burdwan, and MSc (2012) degree in Applied Mathematics from the University of Calcutta, Kolkata. He completed PhD (2018) degree from IISc, Bengaluru. His doctoral research has mainly focused on the spiral structure in disk galaxies and investigation of dynamical effects of the dark matter halo and the interstellar gas on the generation and survival of spiral structure in disk galaxies. After joining IUCAA, he has moved to the area of evolution of galaxies via mergers and gas accretion. His current interest includes N-body modelling of isolated disk galaxies, formation mechanism(s) of lenses in S0 galaxies and their photometric and kinematic characterisation, study of stellar angular momentum evolution in S0 galaxies with lens using presently-available samples from various IFS surveys, deciphering the nature of spiral structure of Milky Way using Gaia data release 2 (DR2), studying the effect of finite-thickness of disk in a galaxy on the spiral structure, and mutual role of shear and interstellar gas and the associated pitch angle in disk galaxies.

Reju Sam John, who has joined IUCAA as a Post-Doctoral Fellow in September 2018. He has obtained BSc (2006) and MSc (2008) degrees from Mahatma Gandhi University, Kottayam. He obtained PhD (2018) degree from Pondicherry University. His research interests are on the study of evolution and energetics of galaxy groups and clusters through cosmological simulations (dark + baryonic matter). He also investigates the thermal and non-thermal effects of interaction between galaxies in clusters and groups by us using a community-developed adaptive mesh refinement simulation code ENZO. He tries to solve some of the long-standing open problems in the physics of formation and evolution of galaxy groups and clusters. He is also interested in the generation and evolution of large-scale shocks, turbulence, cosmic ray acceleration and non-thermal radiation processes in the group cluster forming environment. Since he has been handling big data, he has developed skills in combining statistics, mathematics, programming, and problem-solving to find patterns in the big data.

Bharat Kumar, who has been working in the field of nuclear theory and astrophysics focusing, mainly on developing nuclear energy density functionals of the relativistic mean-field model. Recently, he has generated and tested two new parameter sets (IOPB-I and G3) in different regimes, such as finite nuclei, infinite nuclear matter, and the neutron star. Also, he has used the equation of state of neutron-star matter to calculate stellar properties of the neutron star, such as composition, mass, radii, moments of inertia, tidal deformability, and gravitational wave emissions. He has joined IUCAA as a Post-Doctoral Fellow in September 2018. He has obtained BSc (2010) and MSc (2012) degrees, both from Aligarh Muslim University, and did PhD research work at the Institute of Physics, Bhubaneswar. During PhD, he has proposed new neutron-

rich thermally fissile isotopes, which may be helpful to generate nuclear energy with the help of a nuclear reactor technology.

Sargam M. Mulay, who has completed Bachelors' (2010) and Masters' (2012) degrees in Physics, both from the Savitribai Phule Pune University. She was working as a Junior Research Fellow (2013-2014) at IUCAA under the Department of Science and Technology sponsored research project. Then she moved to the University of Cambridge, UK (2014-2017) to do her PhD at the Department of Applied Mathematics and Theoretical Physics (DAMTP), Centre for Mathematical Sciences. During PhD, her research was focused on understanding the temperature structure of active region jets, which have been observed in the solar atmosphere. She worked on radio, X-ray, UV imaging and spectroscopic observations using several space-based observatories, such as the SDO (AIA, HMI), Hinode (EIS, XRT), RHESSI, IRIS and WIND/Waves. Since June 2018, she joined as a Post-Doctoral Fellow at IUCAA and working with the solar group. Her current research is focused on the initiation and eruption of flux ropes in the solar atmosphere.

Sreejith Padinhatteeri, who works in the field of solar physics, and astronomical instrumentation. He has obtained Bachelors' degree in Physics from the University of Calicut, Kozhikode, and Masters' degree from IIT-Madras, Chennai. He did his PhD thesis titled: Formation and Evolution of Magnetic Structures on the Sun from Space Astronomy Group (SAG) of ISRO Satellite Centre (now renamed as Prof. U.R. Rao Satellite Center), Bengaluru, in 2014, and later worked as Research Associate at Trinity College Dublin, Ireland, and at Manipal Center for Natural Sciences, Manipal. He joined IUCAA as a Post-Doctoral Fellow in February 2018 to work primarily on the Solar Ultraviolet Imaging Telescope, being developed at IUCAA as part of Aditya-L1 satellite project.

Abhishek Paswan, who has joined IUCAA as a Post-Doctoral Fellow in September 2018. He has obtained BSc (2009) and MSc (2011) degrees, both from the University of Allahbad, and completed PhD from Aryabhatta Research Institute of Observational Sciences (ARIES), Nainital. His primarily area of research is to study the galaxy formation and evolution. During PhD, he worked on nearby/local Wolf-Rayet galaxies to understand the star formation scenario by constraining the SFR, chemical abundances and mechanisms responsible for regulating star formation (e.g., galaxy tidal interactions/mergers and AGN feedback) in them. Currently, he has been looking at the physical phenomenon related to star formation scenario in high redshift star forming galaxies at z ~ 1 – 2, where the systems are found at the peak of cosmic SFR density.

Pramod Pawar, who has joined IUCAA as a Post-Doctoral Fellow in April 2018. He completed Bachelors' (2007) Masters' (2010) and PhD (2017) degrees in Physics, all from Swamy Ramanand Teerth Marathwada University, Nanded. During PhD, his research was concentrated on the study of X-ray/optical observations of AGN, focussing on the interplay between the emissions from the accretion disk/corona. He has used the space-borne observational facilities, like, XMM-Newton, Swift, NuStar, and Chandra. He was also involved in the ground calibration of CZTI instrument onboard AstroSat. Currently, he is involved in the study of a sample of AGN observed with AstroSat, and also in the calibration of the SXT instrument to improve its response.

Jayashree Roy, who has joined IUCAA as a Post-Doctoral Fellow (PDF) in July 2018. She obtained BSc (2002), MSc (2004), and PhD (2011) degrees in Physics, all from Gauhati University, Guwahati. During PhD, she worked at the Tata Institute of Fundamental Research (TIFR), Mumbai, on testing, calibration and characterization of Large Area X-ray Proportional Counter (LAXPC) on board AstroSat, and timing and spectral studies of X-ray binaries (XRBs) using space-based X-ray observatories. She had spent 2 years as PDF at the Indian Institute of Astrophysics (IIA), Bengaluru. Her research at IIA was focused on Hanle Echelle Spectrograph (HESP) instrumentation, which has been installed at HCT, Hanle. Further, she has spent 5 years as PDF and Visiting Faculty at UM-DAE Center for Excellence in Basic Sciences (UM-DAE CEBS), Mumbai. Other than the study of XRBs, she was teaching Astronomy course at CEBS. Currently, she is working on timing and spectral.

Santosh Roy, who has joined IUCAA as a Post-Doctoral Fellow in February 2018. He has obtained BSc (2002) degree from Ramakrishna Mission Residential College, Narendrapur, and subsequently joined SNBNCBS, Kolkata, as an Integrated PhD student. He completed his PhD thesis work in 2013. His topic of research was focused on collective and single particle excitations of the atomic nuclei. Immediately after PhD, he has worked as a Post-Doctoral Fellow in nuclear instrumentation projects at KVI-CART, Netherlands, and GSI, Germany. In his second post-doc stint at TIFR, Mumbai, he has primarily worked in the development of scintillator detectors. Subsequently, he has served as a Research Faculty at Manipal Centre for Natural Sciences. Here, his main responsibilities included, development and construction of a 50-KeV ion accelerator, and construction of a liquid Argon scintillator detector for studying weakly interacting particles. He is excited to join LIGO-India project to work on the various aspects of the instrumentation, viz, UHV components, and seismic isolators.

Zahir Ahmad Shah, who has joined IUCAA as a Post-Doctoral Fellow in September 2018. He has obtained BSc (2009), MSc (2011), MPhil (2014), and PhD (2018) degrees, all from the University of Kashmir, Srinagar. His research interest mainly involves the study of broadband spectral and temporal properties of blazars using multi wavelength data from various astrophysical observatories. His work includes developing numerical codes to interpret the broadband data using theoretical emission models. He is also involved in understanding particle acceleration mechanism in the jet. Besides these, he is also involved in the research on blazar classification using their long term gamma-ray flux distributions.

Avinash Surendran, who has completed BTech (2010) degree in Applied Electronics and Instrumentation from the College of Engineering, Thiruvananthapuram, followed by an Integrated MTech-PhD (2018) degrees in Astronomical Instrumentation at the Indian Institute of Astrophysics, Bengaluru. During PhD, he primarily worked on creating a scalable generic platform for adaptive optics real-time control using Field Programmable Gate Arrays (FPGAs). He has also worked on the fabrication of a Lunar Scintillometer to understand the nature of ground-layer atmospheric turbulence characteristics at the Mount Saraswati, Hanle, as part of the National Large Optical Telescope project. He has joined IUCAA as a Post-Doctoral Fellow in August 2018. His fields of interest are site survey instruments, atmospheric turbulence, and adaptive optics.

Meeting on Physics and Astrophysics at the eXtreme (PAX)

The fourth edition of the Meeting on Physics and Astrophysics at the eXtreme (PAX) was held at IUCAA, during August 7 - 10, 2018. There were about 110 participants from India and abroad. The main objective of this meeting was to examine what new physics, astrophysics, and current and future gravitational wave detectors would unravel, in conjunction with other electromagnetic and particle observations. However, one of the highlighted themes for this edition was the Tests of General Relativity.

The structure of the meeting was different from the traditional conferences, in that, there were no formal structured lectures, but panel discussions involving experts, both in the panels and in the audience on outstanding problems in various topics related to gravitational wave physics and astrophysics. The panel discussion sessions were on: (i) Vacuum Spacetimes, (ii) Matter Spacetimes, (iii) Tests of General Relativity, (iv) Electromagnetic Counterparts, (v) Cosmology, (vi) Instruments, (vii) 3G Science Drivers, (viii) Analysis Challenges, and (ix) New and Emerging Methods, led by Bala Iyer (ICTS - TIFR, Bengaluru), Badri Krishnan (AEI - MPG, Germany), Alessandro Nagar (IHES, Turin University, Italy), Paul Lasky (Monash University, Melbourne, Australia), P. Ajith (ICTS - TIFR, Bengaluru), K.G. Arun (CMI, Chennai), Mansi Kasliwal (CalTech, USA), Kenta Hotokezaka (Princeton University, USA), Chris Messenger (University of Glasgow, UK), Archisman Ghosh (NIKHEF, Amsterdam, Netherlands), Rana Adhikari (CalTech, USA), B. Sathyaprakash (Pennsylvania State University, USA), Bernard Whiting (University of Florida, USA), and Rajesh Nayak (IISER, Kolkata). As a part of the meeting, on the first day evening, there was a public lecture by B. Sathyaprakash, at IISER, Pune. The organizers were Sukanta Bose, Ajit Kembhavi, Sanjit Mitra, Somak Raychaudhury, and Tarun Souradeep (all from IUCAA).

Workshop on Observing Universe with AstroSat

Workshop on Observing Universe with AstroSat was conducted at Manipal Centre for Natural Sciences (MCNS), Manipal Academy of Higher Education (MAHE), during September 3 - 5, 2018. The aim of this workshop was to motivate students to pursue higher studies in the field of observational astrophysics in the context of the Indian Space Programme. India's first multi-wavelength astronomical satellite, AstroSat was launched in 2015, which has provided a unique platform to study and understand various galactic and extragalactic astrophysical sources.

One of the most important X-ray payloads onboard AstroSat is LAXPC, which operates in the range 3 - 80 KeV. The UVIT onboard AstroSat observes the universe in broad UV band. In this workshop, the instruments overview, and expected scientific outcome from these two instruments were introduced. Also, a detail data analysis training session for these two instruments was carried out.

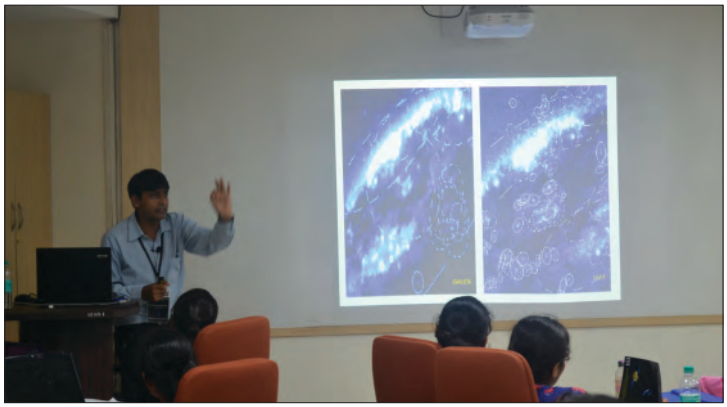
More than 80 applications were received from 33 institutes / universities from 10 different states of India. Finally, 50 participants were selected from 18 institutes/universities from 5 different states (Karnataka, Kerala, Maharashtra, Tamil Nadu and West Bengal). The resource persons were: Debbijoy Bhattacharya (MCNS, MAHE), Jeena K. (Providence Women's College, Kozhikode), Ranjeev Misra (IUCAA), S. Seetha (ISRO), P. Sreekumar (ISRO, through Skype), and C.S. Stalin (IIA, Bengaluru).

There were scientific sessions on (i) Present and Future Astronomy Mission, (ii) Science with AstroSat, (iii) Timing Analysis using AstroSat/LAXPC, (iv) Universe in High Energy, and (v) Science with UVIT. Apart from these, there were data analysis sessions on LAXPC, led by Ranjeev Misra, and on UVIT, led by C.S. Stalin. During LAXPC data analysis sessions, the instrument specifications, LAXPC pipeline and analysis techniques were briefly discussed. Each participant carried out level 1 to level 2 conversion using LAXPC pipeline for a given data set, and they analysed one observed data set from Crab, and found the period of the pulsar. During UVIT data analysis sessions, the conversion of level 1 to level 2 data, and estimation of source flux/magnitude from level 2 data were demonstrated. Then each participant was given one set of level 2 data in three different UV bands, and they estimated one source magnitude in these bands.

At the end of the workshop, there was an open discussion/feedback session. All the participants expressed their overwhelming happiness and satisfaction for their learning during the workshop. They also expressed their strong interest to learn more on AstroSat data analysis, and requested to arrange for any such opportunity like advanced workshop on AstroSat.

Considering the overwhelming response during application for participations and the sincerity and interest shown by the participants, possibility of organising an advanced workshop on AstroSat data analysis was considered. As suggested by Ranjeev Misra, a WhatsApp group of all participants has been created, and they were informed that a feedback form will be sent at the end of December 2018. Based on the responses, a group of participants will be selected for future advanced AstroSat workshop. A few of them can be considered for future internship/research trainee programmes.

This workshop was jointly funded by MCNS, MAHE and IUCAA. Debbijoy Bhattacharya and Ranjeev Misra were the coordinators.



SITARE: Introductory Workshop on Astrophysics

Pt. Ravishankar Shukla University (PRSU), Raipur

SITARE (Southampton IUCAA Training for Astronomical Research and Education): Introductory Workshop on Astrophysics was organized at the School of Studies in Physics and Astrophysics, Pt. Ravishankar Shukla University (PRSU), Raipur, in association with IUCAA and the University of Southampton (UoS), UK, during August 17 - 19, 2018. The workshop was sponsored and funded by the Science and Technology Facilities Council (STFC), UK. The objective was to motivate enthusiastic students to pursue research career in Astronomy and Astrophysics, and the plan was to arrange workshops at various places in India and Nepal, and to select ten promising students from each workshop for an advanced workshop at IUCAA in January 2019. Further, the selected students will get the opportunity to visit UoS for a short period.

The programme became very popular at the beginning itself. There were 170 outstation applicants, out of which, 60 were selected representing different parts of India. In addition to this, there were 90 local participants from PRSU. The resource persons were: Poshak Gandhi (UoS), Gulab Chand Dewangan, Ranjeev Misra, Sonali Sachdeva (all from IUCAA), Sudhanshu Barway (IIA, Bengaluru), Nand K. Chakradhari, Laxmi Kant Chaware, and S.K. Pandey (all from PRSU). The programme covered a broad area in Astrophysics, starting from very basics like, Physics of Stars to Galaxies, Virtual Observatories and to the advanced topics like, Black Holes, Relativistic Jets, Accretion Disc, and Radiative Processes in Astrophysics. Apart from the lectures, there were question-answer, and general discussion sessions. At the end of every lecture and various sessions, there were enough interactions between the lecturers and participants.

The contents of the workshop were very much to the tune of the participants. Below are a few lines from the feedback by one of the participants: "The SITARE workshop was very helpful for me. I express my gratitude for organizing the workshop. I definitely got

clues on where to go and what research topics to focus on, thanks to the talks and discussions, with lecturers and other students during the workshop. I felt that the workshop was beneficial for me, as it opened my eyes to the different fields available and has given enough materials to think regarding my career plans", Chittatosh Karewar (Central University of Karnataka, Kalaburagi).

In summary, the SITARE workshop was very successful. Ajit Kembhavi, Ranjeev Misra, and S.K. Pandey were the coordinators.

SITARE: Introductory Workshop on Astrophysics

Newman College, Thodupuzha

With an objective to motivate enthusiastic students to pursue a research career in Astronomy and Astrophysics (A & A), IUCAA in collaboration with the Southampton University (SoU) conducted the SITARE (Southampton IUCAA Training for Astronomical Research and Education): Introductory Workshop on Astrophysics, sponsored by the Science and Technology Facilities Council (STFC), UK. Department of Physics, Newman College, Thodupuzha, representing the southern region of India, hosted the workshop during September 17 - 19, 2018. The workshop was oversubscribed almost four times, and had participants from the states of Karnataka, Kerala Maharashtra, Rajasthan, and Tamil Nadu.

The workshop started with a short inaugural meeting, presided over by the Educational Secretary of the College, George Thanathuparambil. This was followed by lectures by Naresh Dadhich, Ajit Kembhavi, A.N. Ramaprakash, Jithesh V. (all from IUCAA), Aru Beri, Anjali Rao (both from SoU), K. Indulekha (Mahatma Gandhi University, Kottayam), and Ninan Sajeeth Philip (St. Thomas College, Kozhencherri). The topics were: General Theory of Relativity, Stellar Astrophysics, Optical Astronomy, X-ray Astronomy, Machine Learning Methods in Astronomy, etc. The careful selection of topics for the lectures provided a bird's eye view of the latest developments in the subject, and were capable of sensitizing the participating MSc (Physics) students to research opportunities that exist in this field.

There was a panel discussion on the first day evening, which discussed the various aspects along with the career opportunities in A&A. The programme overshot the stipulated time due to the interest shown by the students. On the second day night, there was a sky watch programme conducted using the 11 inch and 5 inch telescopes, which provided a novel experience to the students.

A major feature of the programme was the public lectures conducted in five other colleges in the region by the resource persons, which served to offer its benefits to a greater audience. Each of these lectures was attended by around 100 - 200 participants. The programme was capable of generating interest in the subject as evidenced by the active interactions by the participating students.

The feedback from the participants indicated that they were much happy and contended with what they achieved from the workshop. Ajit Kembhavi, Ranjeev Misra (IUCAA), Joe Jacob (Newman College) were the co-ordinators.

Introductory Workshop on Astronomy and Astrophysics for Women

The Department of Physics, Alphonsa College, Pala, Kerala, oraganised the Introductory Workshop on Astronomy and Astrophysics for Women, during September 13 - 15, 2018, for the benefit of UG and PG girl students from various colleges and universities in Kerala. The programme was organised to foster the interest in Astronomy and Astrophysics among the girls in the region and bring up more women astronomers.

The resource persons and their topics were: Jincy Devasia (Henry Baker College, Melukavumattam) on Introduction to X-ray Pulsars, Savithri Ezhikode (IUCAA) on An Overview of X-ray Astronomy, Nayana A.J. (NCRA, Pune) on Radio Supernovae, Jessy Jose (IISER, Tirupati) on Star Planet Formation: An Overview, Minu Joy (Alphonsa College, Pala) on Cosmic Microwave Background Radiation, Indulekha K. (Mahatma Gandhi University, Kottayam) on Binaries in Stellar Clusters, Resmi L. (IIST, Thiruvananthapuram) on The Dawn of Multi-Messenger Astronomy, Prasia P. (Government College, Chittur) on Gravitational Waves: Past, Present and Future, and Annapurni Subramaniam (IIA, Bengaluru) on The First Indian Space Observatory: AstroSat and the UV Telescope.

Forty one women participants were selected from the 75 applicants. The programme consisted of lectures, sky watch and problem solving sessions. A special lecture on the topic: The Role of Women in Astronomy was delivered by Resmi L., which provided the students an opportunity to get to know some of the prominent women scientists, who have overcome prejudice and exclusion to make significant contributions to their field.

This workshop was the first of this kind in India, led exclusively by women and participated by girl students. It was a grand success, and there were a lot of interactions and discussions with the resource persons, and among the participants also. Minu Joy and Savithri Ezhikode were the coordinators of the workshop.

Public Outreach Activities

Teachers' Workshop on Science Toys and Basic Astronomy

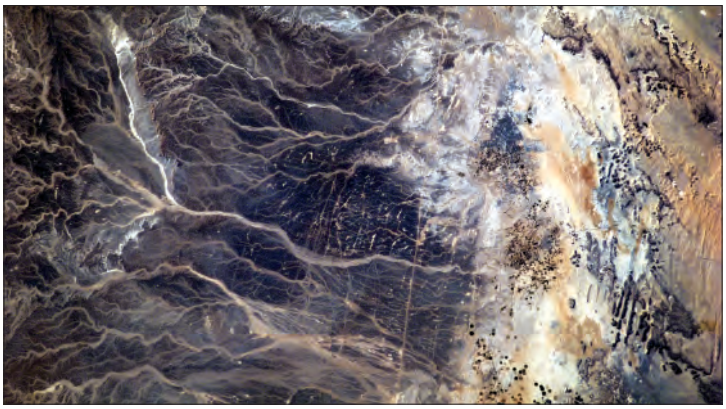
A workshop for science teachers of government Marathi medium schools was held on July 21, 2018, at Muktangan Vidnyan Shodhika (MVS), IUCAA. There were 35 participants from different schools. In the first half of the day, all the teachers were given material kits to make a few toys. The selected toys were related to the existing science curricula of 8th 9th and 10th classes, and these toys would be helpful for the teachers in the classroom teaching. The second half of the workshop was dedicated to astronomy topics in science and geography curricula. In this session, along with gravity and seasons, the newly introduced topics like life-cycle of stars were elaborated to help in teaching astronomy at the school level in simple manner. The workshop was coordinated by Sonal Thorve and Maharudra Mate (both from IUCAA).

Workshop on Teaching Science with Toys

A Workshop on Teaching Science with Toys for school teachers from Karve Shikshan Sanstha, Pune, was held on August 25, 2018, at MVS, IUCAA. All the participants were given material kits to make fifteen toys. The topics of sound, optics, electricity, motion, force, work and energy were covered in the session. Demonstrations of 30 to 35 toys were given with a brief idea of how to use these toys in teaching textbook science and even more. The selected toys were related to the existing science curricula of 8th 9th and 10th classes, and these toys would be helpful for the teachers and the volunteers in the classroom teaching. The workshop was coordinated by Shivani Pethe and Rupesh Labade (both from IUCAA).

Sally Ride EarthKAM, Mission 63

For the first time, IUCAA participated in the Sally Ride EarthKAM (Earth Knowledge Acquired by Middle school students) run by NASA, and was organised at the Modern High School (English Medium), Shivajinagar, Pune, on September 30, 2018. The programme invites students and teachers around the world to explore the earth from the perspective of the International Space Station (ISS). The camera onboard ISS has a dedicated time slot for capturing the pictures of geographical locations requested by student participants. Thirty two students took part in this year programme, and successfully received the images of different parts of the globe with various geological features. The programme was coordinated by Shivom Gupta (IUCAA).



Science and Astronomy Outreach Programmes

The Science and Astronomy Outreach Programmes were organised at Belagavi, Karnataka, during September 29 - October 1, 2018. On the first day, the Belagavi Science Centre, organised a science toys workshop for eighty middle school students. Sonal Thorve was the resource person. Along with a few toys, the students also made CD spectroscopes and observed spectra from different types of sources. On the evening of September 30, a public sky-watching session was organised, and on October 1, Sonal Thorve delivered a talk on Current Developments and Career Paths in Astronomy and Astrophysics, at K.L.E. Society's Raja Lakhamagouda Science Institute, Balagavi, which was attended by 120 college students

Celebration of 150th Anniversary of Helium Discovery

A special talk was organised on August 18, 2018, by the Delhi Public School, Kondhwa, Pune, on the occasion of the Science Festival of the school, to celebrate the 150th anniversary of the discovery of Helium, which was discovered on August 18, 1868, from the observations of total solar eclipse seen from India. Sonal Thorve was the resource person, who talked about the second most abundant element, Helium, in the universe, followed by the history of its discovery.

Second Saturday Lectures

July 14, 2018: Somak Raychaudhury (IUCAA), on The Dark Universe.

August 11, 2018: Bhooshan Gadre (IUCAA), on Datum.

September 8, 2018: Shekhar C. Mande (NCCS, Pune), on Who are We?

All these talks are available at our YouTube channel - https://www.youtube.com/user/IUCAASciPOP/

During July - September 2018, IUCAA Public Outreach group has conducted 3 basic astronomy workshops, 6 science toys workshops, and 8 campus visits, with an approximate reach to about 1,000 people.

Seminars

04.07.2018: **Debi Prasad Choudhary,** on *Photospheric and chromospheric properties of the umbral and penumbral fibril loops.*

11.07.2018: **Luke Chamandy,** on *Accretion in common envelope evolution.*

18.07.2018: **AvinashSurendran,** on *SPARC (Scalable platform for adaptive optics real-time control).*

05.09.2018: **Shreya Banerjee,** on *How do inflationary perturbations become classical?*

Space Science and Technology Talk

A special talk on Space Science and Technology was organised by the Priyadarshani School, Dighi, Pune, on August 30, 2018, in collaboration with the Pimpri-Chinchwad Science Park. Sonal Thorve was invited as a resource person. She demonstrated a few science toys, through which the concepts involved in space science and technology could be easily understood.

Colloquia

12.07.2018: **Prateek Sharma,** on *Global MHD simulations of accretion flows.*

02.08.2018: **Badri Krishnan,** on *The approach of a black hole horizon to equilibrium.*

24.09.2018: **Swara Ravindranath** on *Exploring the reionization epoch with JWST.*

Neem Seminars

03.07.2018: **P.N. Pandita,** on *Reconstructing the Higgs potential.*

03.07.2018: **Gazi Ameen Ahmed,** on *Optical characterization of interstellar particulate matter using experimental and computational methods.*

10.07.2018: **Jaswant Kumar Yadav,** on *Lack of clustering in low-redshift 21-cm intensity maps.*

10.07.2018: **Suresh Kumar,** on *Pseudo non-minimal interactions in dark matter and relativistic relics via scale-independent energy-momentum squared gravity.*

Visitors

(July - September 2018)

Oluwashina Adegoke, Rana Adhikari, Anil Agarwal, Akash Agnihotri, P.C. Agrawal, Gazi Ameen Ahmed, P. Ajith, Alka, G. Ambika, G. C. Anupama, Raghav Arora, K.G. Arun, Kavitha Arur, Anjana Ashok, Praveer Asthana, Debades Bandyopadhyay, Arunima Banerjee, S.K. Banerjee, Shreya Banerjee, Smaranika Banerjee, Srimanta Banerjee, Monica Bapna, Samuzal Barua, Soummyadip Basak, Karabee Batta, N. S. Benerji, Sayantani Bera, Aru Beri, Swetha Bhagwat, Varun Bhalerao, Pritikana Bhandari, Naseer Iqbal Bhat, R.C. Bhatt, Anwesh Bhattacharya, Parag Bhattacharya, Rajorshi Bhattacharya, Soham Bhattacharyya, Sudip Bhattacharyya, Yashpal Bhulla, Mahasweta Biswas, Promila Biswas, Dmitry Blinov, Anshuman Borgohain, Subenoy Chakraborty, Sumanta Chakraborty, Ankita Chakravarty, Luke Chamandy, Sourav Chatterjee, S. M. Chitre, Debi Prasad Choudhary, Parimal Dilip Darne, Abhishek Das, Debaiudh Das, P.K. Das, Subinoy Das, Bipash Dasgupta, Patrick Dasgupta, Prathamesh Dash, Debabrata Deb, Kabita Deka, Prasanna Deshmukh, Lankeswar Dey, Mira Dey, Monika Dharma, Suraj Dhiwar, P. P. Divakaran, Debi Prosad Duari, Dayal Singh Duggal, Sandip Dutta, Savithri Ezhikode, Deepali Gaba, Sebastian Gaebel, Shashikiran Ganesh, Sharad Gaonkar, Akash Garg, Gurudatt Gaur, Blesson George, Abhirup Ghosh, Archisman Ghosh, Shounak Ghosh, Sushant G. Ghosh, Tathagata Ghosh, Tuhin Ghosh, Gourab Giri, V. Girish, V. Girish, Rupjyoti Gogoi, Kishore Gopalakrishnan, Umananda Dev Goswami, Milind Gowardhan, Shivappa B. Gudennavar, Ajesh Gulati, Pawan Kumar Gupta, Suhani Gupta, K.P. Harikrishnan, M.K. Haris, Dhiraj Hazra, M. Honey, Kenta Hotokezaka, Nazma Husain, K. Indulekha, Bala Iyer, Kishore Iyer, Sean Hodges Jackson, Joe Jacob, Ayush Jain, Pankaj Jain, Reju Sam John, A. S. Joshi, Yogeshkumar Dileepkumar Joshi, Kanti Jotania, Amareswari K., Anusree K.G., Ashok Kalindi, Rahul Kashyap, Mansi Kasliwal, Shilpa Kastha, Vikram Khaire, Nishikanta Khandai, Sheeraz Ahmad Khanday, Rukaiya Khatoon, Ramasami Krishna, Badri Krishnan, Dilip Krishnaswamy, Bharat Kumar, Lalit Kumar, Prashanth Kumar, Pravir Kumar, Shibesh Kumar, Sumit Kumar, Suresh Kumar, Nimisha Kumari, Ioannis Kypriotakis, Paul Lasky, Ankita Limbachiya, N. Madhusudhan, Manzoor A. Malik, Abhijit Mandal, P. K. Manoharan, Aditya Manuwal, Ajit Kumar Mehta, Parita Mehta, Christopher Messenger, Ambuj Kumar Mishra, Bivudutta Mishra, Chandrakant Mishra, Tanmaya Mishra, Kuntal Misra, N. P. S. Mithun, Abhishek Mohapatra, Soumen Mondal, Sneha Prakash Mudambi, Debnandini Mukherjee, S. Mukherjee, Subroto Mukherjee, Krishnendu N. V., Alessandro Nagar, Nagaraju, Remya Nair, Anuj Nandi, Rana Nandi, Wrishik Naskar, Rajesh Nayak, Devendra Ojha, Mahesh P. K., Archana Pai, N. Panchapakesan, Sambit Kumar Panda, Divya Pandey, S.K. Pandey, Sanjay Pandey, Mahadev Pandge, P.N. Pandita, Gina Panopoulou, Arvind Paranjpye, Sai Paranjpye, Pradeep Paryane, K.D. Patil, M. K. Patil, Pravin Patole, Rohan Pattnaik, B.C. Paul, Biswajit Paul, Geetha Paul, Nupur Paul, Ninan Sajeeth Philip, Khun Sang Phukon, Anil Prabhakar, Anirudh Pradhan, Krishna Prajapat, Aragam Prasanna, Athul R.T., Radhakrishna, Archita Rai, G. Rajalakshmi, Gayathri Raman, Vikram Rana, A. R. Rao, Shantanu Rastogi, Ajay Ratheesh, Swara Ravindranath, Divya Rawat, B. Eswar Reddy, L. Resmi, Poulami Dutta Roy, Surojit Kumar Roy, Bubbly S.G., K.S. Sreekara Sabarish, T. Sahay, Gautam Saikia, Nidhi Saini, Muhammed Saleem, Gauranga Charan Samanta, Prasant Kumar Samantray, M. Sami, Shishir Sankhyayan, Varun Saraswat, Arnab Sarkar, Deekshya Roy Sarkar, Tamal Sarkar, B. S. Sathyaprakash, S. Seetha, Anand Sengupta, Soumitra Sengupta, Sujan Kumar Sengupta, T.R. Seshadri, B. Shah, Vishwangi Shah, Zahir Ahmad Shah, Nigar Shaji, Prateek Sharma, Ramkishor Sharma, S. K. Sharma, Shivani Sharma, Umesh Kumar Sharma, Sanjar Shaymatov, Sherehan Shehata, Aditya Singh, H.P. Singh, Jasbir Singh, Manvinder Pal Singh, Atreyee Sinha, Monika Sinha, Surendra Nadh Somala, P. Sreekumar, Rahul Srinivasan, Gaurav Srivastava, C.S. Stalin, Ravi Subrahmanyan, Avinash Surendran, Abhimanyu Susobhanan, Prayas Sutar, Rajalakshmi T.R., Amit Tamrakar, Amira Ahmed Tawfeek, Tejaswi, Devika Tharakkal, Neal Thomas, Harshit Tiwari, Srishti Tiwari, S.K. Tripathy, KaWa Tsang, Paniveni Udayashankar, Janmesh Ukey, C. S. Unnikrishnan, Sanil Unnikrishnan, Gayathri V., Nived V.N., Santosh Vadawale, Bhargav Vaidya, Manoj Varma, Jeevan Vedamurthy, Ramasamy Venugopal, Chetan Verma, Murli Manohar Verma, Rahul Kumar Walia, Bernard Whiting, J.S. Yadav, and Jaswant Kumar Yadav.

Visitors Expected

October 2018

Dharam Vir Ahluwalia, IIT, Guwahati; Kabita Deka, Tezpur University; Prasun Dhang, IISc, Bengaluru; Tathagata Ghosh, IIT, Kanpur; David Hilditch, University of Lisbon, Portugal; Nitesh Kumar, University of Delhi; Sujata Kundu, Narula Institute of Technology, Kolkata; Vishnu Namboothiri, Mahatma Gandhi University, Kottayam; P. N. Pandita, IISc, Bengaluru; Rohan Pattnaik, IIIT, Bhubaneswar; Chayan Ranjit, Egra S.S.B. College; Divya Rawat, IIT, Kanpur; Pinaki Roy, Christ University, Bengaluru; Ranjan Sharma, Cooch Behar Panchanan Barma University; S. T. Khaiminthang Vaiphei, Manipur University, Imphal; and Ramasamy Venugopal, South Africa.

November 2018

Samuzal Barua, Hojai College; Tomaso Belloni, INAF, Brera; Maitraya Kanta Bhattacharyya, IISER, Kolkata; Atreyee Biswas, Maulana Abul Kalam Azad University of Technology, Kolkatal; Subenoy Chakraborty, Jadavpur University, Kolkata; Debika Choudhury, TIFR, Mumbai; Santosh Damayyawar, SRTM University, Nanded; Dipanjana Das, Jadavpur University, Kolkata; Sourav Dutta, University of Calcutta, Kolkata; Matthew Graham; Soumya Jana, PRL, Ahmedabad; A. S. Joshi, RRCAT, Indore; Kanti Jotania, M.S. University of Baroda, Vadodara; Anusree K. G., Mahatma Gandhi University, Kottayam; Vedant Kumar; Sreelakshmi M., Government College, Madapally; Ashish Mahabal, Caltech, USA; Yashodhan Manerikar, IIT-Madras, Chennai; Helen Mason, University of Cambridge, UK; Jose Mathew, IISER, Thiruvananthapuram; Jessica McIver, Caltech, USA; Anupama Mohanan, Government College, Madapally; Kunal Mooley, Caltech, USA; Shubhabroto Mukherjee, NIT, Tiruchirappalli; Alekha Nayak, PRL, Ahmedabad; Vishal Pabboj, SRTM University, Nanded; Deepak Pandey, University of Bonn, Germany; Surajit Paul, Savitribai Phule Pune University; Devraj Pawar, R.J. College, Mumbai; Ninan Sajeeth Philip, St. Thomas College, Kozhencherri; Pavlos Protopapas, Harvard University, USA; Anjali Rao, University of Southampton, UK; B. S. Ratanpal, M.S. University of Baroda, Vadodara; Rajalakshmi T. R., Mahatma Gandhi University, Kottayam; Vanzarmawii, Mizoram University, Aizawl; and R. G. Vishwakarma, Universidad Autonoma de Zacatecas, Mexico.

December 2018

Bobomurat Ahmedov, Ulugh Beg Astronomical Institute, Uzbekistan; Raghav Arora, BITS-Pilani, Goa; K. G. Biju, W.M.O. Arts and Science College, Wayanad; Suresh Chandra, Amity University, Noida; Goutami Chattopadhyay, University of Calcutta, Kolkata; Surajit Chattopadhyay, Amity University, Kolkata; Manish Chauhan, IIST, Thiruvananthapuram; Sourav Roy Chowdhury, Vidyasagar College, Kolkata; Debaiudh Das, NISER, Bhubaneswar; Susmita Das, University of Delhi; Ujjal Debnath, IIEST, Shibpur; Nisha Godani, GLA University, Mathura; K. Indulekha, Mahatma Gandhi University, Kottayam; Joe Jacob, Newman College, Thodupuzha; Rinku Jacob, Cochin College, Kochi; Tamanna Jain, University of Delhi; Charles Jose, CUSAT, Kochi; Shashi Kanbur, SUNY, Oswego, USA; Soumyodipta Karmakar, Amity University, Kolkata; Nishikanta Khandai, NISER, Bhubaneswar; Richa Kundu, University of Delhi; Sayan Kundu, IIT, Indore; Pradip Mukherjee, Barasat Government College, Kolkata; Kaushik Naskar, IIT, Kanpur; Nagayoshi Ohashi, Subaru Telescope, Japan; Manu Paranjape, University de Montreal, Canada; K.D. Patil, B.D. College of Engineering, Wardha; Ajay Potdar, IIST, Thiruvananthapuram; Adarsh Ranjan, IoA, Paris, France; Prabir Rudra, Asutosh College, Kolkata; Gauranga Samanta, BITS-Pilani, Goa; Abdus Sattar, Barasat Government College, Kolkata; Kazuhiro Sekiguchi, Japan; Parth Shah, BITS-Pilani, Goa; Arijit Sharma, IIT, Tirupati; Nishant Singh, NORDITA, Sweden; Peter Tino, University of Birmingham, UK; Saku Tsuneta, National Astronomical Observatory of Japan; Paniveni Udayashankar, Mysuru; Bhargav Vaidya, IIT, Indore; Murli Manohar Verma, University of Lucknow; and Michitoshi Yoshida, Subaru Telescope, Japan.

Long Term Visitors

Ajesh Gulati, TMT Project Office, USA; and Dhruba J. Saikia, IUCAA.

Khagol (the Celestial Sphere) is the quarterly bulletin of

IUCAA

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