

KHAGOL



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National Science Day CELEBRATIONS 2011



Children
engrossed
in the
various
activities
of the
National
Science
Day



The National Science Day - 2011 was celebrated, as usual, with enthusiastic and efficient contribution from all the IUCAA members and visitors. As has been the tradition for more than a decade now, the occasion was celebrated on three days.

On February 26, about 300 students from 60 schools responded to IUCAA's invitation and participated in the inter-school competitions. These students from classes VIII and IX took part in the drawing, essay and quiz competitions. Crossword puzzles were designed in Marathi and English by J. V. Narlikar and T. Padmanabhan respectively, to keep teachers occupied while the students were busy. Arvind Gupta conducted a session for teachers and students on making Science toys and doing Science experiments.

Contents

National Science Day	1, 2, 3, 4
Congratulations	3
Announcements	4, 7
Past Events	5, 6, 7, 8, 9, 10
Obituary	6
Seminars and Colloquium	6
IUCAA Preprints	9
Visitors	11
Know Thy Clouds	12



Various other Activities on the National Science Day

The programme for the school students of Ambegaon Taluka was conducted on March 19, 2011. The essay, and drawing competitions were held in the campus of IUCAA Girawali Observatory and the quiz competitions were conducted in the Shivajirao Adhalrao Patil Vidyalaya, Landewadi.



The IUCAA, Pune campus was opened to the general public on February 28. The open day started at 10:30 a.m. and the scheduled programmes went on till 7.00 p.m.

Science Toys were demonstrated by 30 students from New English School and Tyagi School in the Chandrasekhar Auditorium foyer. The students did a wonderful job of explaining various science experiments developed at the Muktangan Vidnyan Shodhika (MVS) of IUCAA to large crowds, who passed through the exhibition.



Special workshops on making a simple spectroscope using waste CDs were held at MVS. Student volunteers from Fergusson College helped 300 people to make their own spectroscopes and also explained their working and importance in Astronomy. Amateur astronomer volunteers explained the Foucault pendulum, and many outdoors science models in the Science Park. Live images of sunspots were also shown with a special solar viewer. The architecture of the IUCAA campus was also showcased by four architecture students with the help of a scale model. All volunteers were trained a week before the event by the Public Outreach staff.



Continuous demonstrations of the IUCAA Virtual Observatory and work done on the World Wide Telescope software were conducted by Sibasish Laha and Santosh Jagade. The Instrumentation Laboratory group displayed the instruments to explain various concepts related to Optical Astronomy. Similarly, the members of the Radio Astronomy Laboratory illustrated the scientific concepts on Radio Astronomy.

Spectacular posters, introducing general Astronomy and the related work done at IUCAA, were put up by the Research Scholars and Post-doctoral Fellows of IUCAA. A series of related public talks, each of 30 minutes duration, were given by Surajit Paul, Varun Sahni, Pranjal Trivedi and Gourav Goswami. These talks detailed some topics of the posters. A special poster about Cosmology using computers was displayed by Jayanti Prasad, who also showed a few simulations of the Universe.

The IUCAA Kund hosted a novel aero-modelling show conducted by Pradyumna Gogate. This popular attraction featured small flying models of helicopters and aeroplanes.

Another attractive event was a live interaction with Vijay Mohan from the IUCAA Girawali Observatory. The working of the 2 m telescope at IGO was shown and explained over Skype in two sessions to as many as 1000 people gathered in the

Chandrasekhar Auditorium. The same venue was also used for screening a series of films on Astronomical topics by Suprit Singh.

The Chandrasekhar Auditorium hosted a quiz programme in Astronomy for the general public in the afternoon. Later, in a special question and answer session, J. V. Narlikar and T. Padmanabhan answered various Astronomy questions from the public. This session was coordinated by Arvind Paranjpye.

The day ended with a public talk by A. N. Ramaprakash on the Nobel Prize in Physics 2010.

Untimely rains prevented the evening sky-show from being conducted, although the spirit of the Open Day was hardly dampened. There were over 6500 visitors over the course of the day.

Results of various competitions held on the occasion of the National Science Day

at IUCAA on February 26, 2011

The prizes were distributed by Ajit Kembhavi, Director of IUCAA.

The N.C. Rana Trophy for Best School Performance went to Army School, Kirkee for winning two prizes.

Science Quiz

- 1st:** Chirag Ramdas, Chaitanya Mukund Tappu, and Nirant Rajendra Patil, from Bharatiya Vidya Bhavan Sulochana Natu Vidya Mandir, Pune.
- 2nd:** Shaunak Umesh Lohite, Saurabh Sunil Godbole, and Nandan Milind Bedekar, from D.E.S. Secondary School, Pune.
- 3rd:** Ankit Dhanraj Muthiyan, Vyyom Bhooshan Kelkar, and Vaibhav Vinay Tipnis, from Jnana Prabodhini Prashala, Pune.

Essay: Marathi

- 1st:** Karanjkar Rujuta Digambar, from Mahilashram High School, Karvenagar, Pune.
- 2nd:** Jui Milind Bhagwat, from Jnana Prabodhini Navnagar Vidyalaya, Pune.

Essay: English

- 1st:** Abhishek Sharma, from Army School, Kirkee.
- No second prize was given.

Drawing

- 1st:** Kamlesh Rajkumar Kumawat, from Shri Fattechand Jain Vidyalaya, Pune.
- 2nd:** Nitish Naikwade, from Army School, Kirkee and Bilal Pirjade, from Judson High School, Pune.

at New English School, Landewadi on March 19, 2011

Science Quiz

- 1st:** Rutwik Milind Khandeshe, Dnyanesh Popat Bhite, and Sahil Hamid Inamdar, from New English School, Landewadi.
- 2nd:** Supriya Balasaheb Dumbre, Komal Dattatray Borhade, Bhagyashree Ramesh Waghmare from Sharad Chandraji Pawar Vidyalaya, Dimbhe.
- 3rd:** Tejaswini Kisan Hinge, Prashant Pradip Parekh, and Shubham Devidas Hinge, from Vidya Vikas Mandir, Awsari Budruk.

Essay: Marathi

- 1st:** Zadage Sudarshan Subhash, from J.M. High School, Chincholi.
- 2nd:** Kokane Anruta Kerbhau, from Sant Dnyaneshwar Vidyalaya, Chas.

Essay: English

Only one essay was selected.

Bheke Prachi Deepak, from New English School, Landewadi.

Drawing:

- 1st:** Aniket Bhagwan Pansare, from J.V.M. School, Ghodegaon.
- 2nd:** Ameya Dattatray Jadhav, from Kamalaja Devi Vidyalaya, Kalamb.

[Please find the prize-winning drawings on the next page.]

Congratulations to...

- **Arvind Gupta**, on being conferred with the **Sri Chandrasekarendra Saraswati National Eminence Award** in the field of Science and Technology by the South Indian Education Society (SIES), Mumbai.
- **Jayant Narlikar**, on being conferred with (i) **The Maharashtra Bhushan Puraskar** by Government of Maharashtra, and (ii) **D.Litt. by Tilak Maharashtra Vidyapeeth, Pune**.
- **Arvind Paranjpye**, on being conferred with the **Vocational Excellence Award** by The Rotary Club of Gandhi Bhawan, Pune.

Welcome ...

Bibhas Ranjan Majhi, who has joined as a Post-doctoral Fellow. His areas of research are Black Holes, Gravity, etc.

... Farewell

Prasant Kumar Samantray, who has joined the Arizona State University, USA, to complete his Ph.D. there.

The prize-winning drawings of the competitions held at IUCAA, and at Girawali



1st : Kamlesh Rajkumar Kumawat, from Shri Fattechand Jain Vidyalaya, on the theme, Science in the Ancient World.



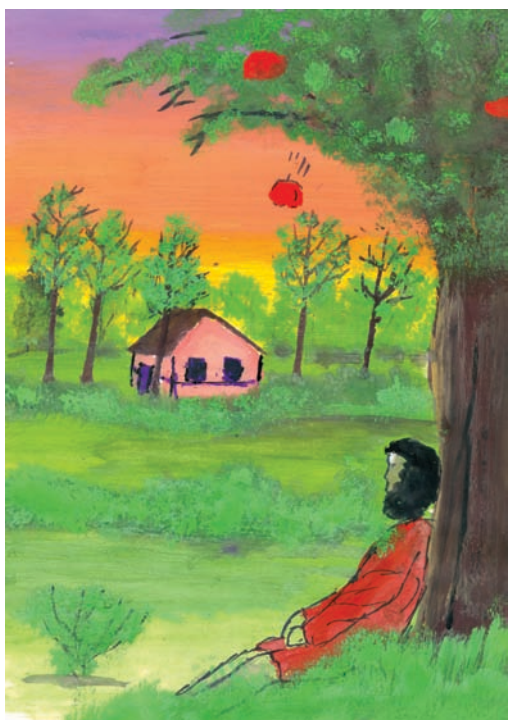
1st : Aniket Bhagwan Pansare, from J. V. M. School, on the theme, Science in the Ancient World.



2nd : Nitish Naikwade, Army School, Kirkee, on the theme, Science Breakthrough of the 20th Century.



2nd : Ameya Dattatray Jadhav, from Kamalaja Devi Vidyalaya, Kalamb, on the theme, Tomorrow's Technology.



2nd : Bilal Pirjade, Judson High School, on the theme, Science in the Ancient World.

Indo-UK Seminar : Confronting particle-cosmology with PLANCK and LHC at IUCAA, August 10-12, 2011

We live in a time when we will be able to deeply explore physics of the universe at two very different length scales; while on one hand, collider based experiments, such as the LHC, will be seeking new fundamental particle interactions well below the nanometer scale, and on the other hand, satellite based experiments, such as, PLANCK will be exploring physics on cosmic scales.

The meeting aims to bring together experts from UK and India working on the physics of the early universe and related data analysis to raise and discuss new frontiers of our knowledge that could be addressed with upcoming results from PLANCK, LHC and other experiments.

By design, Indo-UK seminars, funded by the Royal Society, London, and Department of Science and Technology, Government of India, have to be limited to a total of 20 participants. **Hence, participation in the Seminar is strictly by invitation only.** The meeting is being jointly coordinated by Tarun Souradeep, L. Sriramkumar from India, and Anupam Mazumdar from UK. IUCAA has also offered some auxiliary funding to promote and support invited university participants.

Workshop on Data Analysis Techniques in Astronomy



Participants and Lecturers of the Workshop on Data Analysis Techniques in Astronomy



The Department of Statistics, Burdwan University (B.U.), and IUCAA Resource Centre, Kolkata, jointly organized a three-days workshop on Data Analysis Techniques in Astronomy, during November 23 - 25, 2010. This workshop was sponsored by IUCAA, Pune. There were twelve resource persons from different well-recognized organizations, and thirty participants from various educational institutions of India. The inaugural session was chaired by S. P. Mukherjee, Ex-centenary Professor, Calcutta University, and Dilip Roy was the Chief Guest. Rabindra Nath Das, Head, Department of Statistics, (B.U.) gave the welcome address. In the technical sessions, broad areas of Astronomy, Astrophysics, and Statistics were covered by the speakers. D. Roy, (B.U.), A. Chatterjee, (C.U.), A. K. Chattopadhyay, (C.U.) and A. Sengupta, ISI, Kolkata, delivered the lectures on various statistical data analytic tools, specially useful in Astronomy and Astrophysics. Ranjeev Misra, IUCAA, and A.K. Sen, Assam University, broadly discussed on topics of Astrophysics at the fundamental level. T. Chattopadhyay, (C.U.), S. Chowdhury, (B.U.), S. Chakraborty, (Visva-Bharati University, Shantiniketan), S. Mukherjee, (IRC, Kolkata.) and Ajit Kembhavi, Director, (IUCAA), Pune, vividly discussed various topics related to galaxies. There were laboratory sessions for using the statistical software to analyze the data related to Astronomy and Astrophysics. At the end, the valedictory session was chaired by B.C. Sarkar, Department of Physics, (B.U.), and Ajit Kembhavi was the Chief Guest. On inviting feed-back, most of the participants had acknowledged the success of the workshop. Lastly, the programme ended with a vote of thanks proposed by A. Gupta, (B.U.)

Ranjeev Misra, and Arindam Gupta, jointly coordinated the workshop

Workshop on Astrophysics and Cosmology

A three-days workshop on Astrophysics, and Cosmology, co-sponsored by IUCAA and West Bengal State University, Barasat, was jointly organised by the Department of Physics, West Bengal State University, Barasat, and IRC, Kolkata during November, 26-28, 2010, and held at the WBSU Campus.

The objective of the workshop was to familiarise the participants with the field of Astronomy and Astrophysics and also to highlight the recent trends in Astrophysical research. The workshop consisted of introductory lectures on various topics of current research interests like, Measurement Techniques in Astronomy, Birth and Evolution of Stars, Compact Objects, Large Scale Structure of the Universe, etc.

Participants were selected from a large number of applicants on the basis of their, research background and recommendations. Though the workshop was primarily intended for young faculty members from college/universities and Research Scholars working in related areas of Physics, some interested post graduate students were also invited to participate, so that, they may draw inspiration to pursue further studies and research in the emerging areas of Astronomy and Astrophysics.



Participants of the Workshop on Astrophysics and Cosmology

contd....

The workshop was inaugurated by Ashok Ranjan Thakur, Vice-Chancellor, WBSU. The first day session started with the lecture by Ajit Kembhavi (Director, IUCAA) and thereafter by Ranjeev Misra (IUCAA) and Tanuka Chatterjee (Department of Applied Mathematics, University of Calcutta). Somnath Bharadwaj (Department of Physics and Meteorology, IIT Kharagpur) and Asoke Sen (Department of Physics, Assam University) delivered two sets of lectures on the second day. The third day lectures were given by Sailo Mukherjee (IRC, Kolkata) and Jishnu Dey and Mira Dey (Department of Physics, Presidency College, Kolkata). Some interactive sessions were also held, so that the participants may closely interact with the speakers.

A total of 36 participants from various college / universities / institutes attended the workshop in addition to the post-graduate students and faculties of the host university. The workshop was jointly coordinated by Ranjeev Misra from IUCAA and Anirban Saha from the Department of Physics, WBSU.

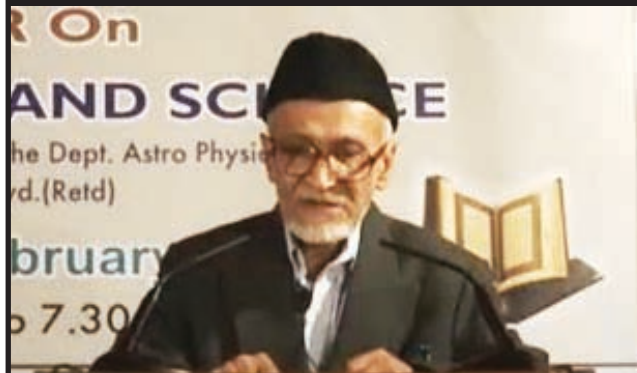
UGC Seminar on Recent Advances in Relativity, Cosmology and Astrophysics



Participants and lecturers of the UGC seminar

A two - days UGC Seminar on Recent Advances in Relativity, Cosmology and Astrophysics was held at the Department of Physics, North Bengal University (NBU), Siliguri, jointly organized by IUCAA Resource Centre (IRC) and Physics Department, NBU, on February 28 and March 1, 2011. The seminar was organized to expose the recent developments in the fields of Cosmology and Astrophysics for the PG students of NBU, including other universities. There were 100 participants. The speakers were N. K. Dadhich (IUCAA), C. S. Unnikrishnan (TIFR), R. Tikekar (IUCAA), D. Majumdar (SINP), D. P. Duari (MPBP), B. Modak (KU), S.K. Ghosal (NBU), and S. Mukherjee (IRC). A public talk (Why Einstein : Relativity for Everyone) by N. K. Dadhich was organized on February 28, 2011. It was attended by 25 school students, including the participants of the seminar and people from other departments. A popular talk, entitled, Voyage to the Cosmos was delivered by D. P. Duari on March 1, 2011. The seminar was coordinated by B. C. Paul and M.K. Das, NBU.

Obituary



S. M. Alladin (March 1931-March 2011)

Professor Saleh Mohammed Alladin passed away on March 20, 2011, aged 80, at Khadian, Punjab. Professor Alladin was a pioneer in semi-analytic work on galaxy interactions. He joined the Astronomy Department in Osmania University, Hyderabad in 1964, and worked there until his retirement. He was one of the people who helped to bring the Department to prominence. Professor Alladin was a Visiting Associate of IUCAA, and contributed much to the development of various academic activities of the institute. He was a very inspiring person, who helped many young people to carry out fine research, and was known to be very kind, gentle and affectionate. In his later years, he devoted himself to religious and spiritual matters. His passing away is a great loss to astronomy in the country.

Seminars and Colloquium

Listed below are the seminars given at IUCAA during January - March 2011.

12.01.2011 Arthur I. Miller on *Empire of the stars: Friendship, obsession and betrayal in the quest of black holes*; 18.01.2011 Poonam Chandra on *Cosmological transient objects*; 27.01.2011 Suman Bhattacharya on *Galaxy clusters- Laboratory for Astrophysics and Cosmology*; 01.02.2011 D.V. Ahluwalia on *Neutrino oscillations with disentanglement of a neutrino from its partners*; 04.02.2011 Rahul Nabar on *High performance computing: A survey of recent developments*; 08.02.2011 D.V. Ahluwalia on *Elko dark matter: A conceptual story*; 10.02.2011 Andrew Debenedictis on *Introduction to Loop quantum gravity and Loop quantum black holes*; 11.02.2011 Andrea Mignone on *The Pluto code for computational astrophysics: Challenges and applications*; 14.02.2011 Tom Gehrels on *A new cosmology for the birth and death of our universe*; and 03.03.2011 Vladimir Burdzyuzha on *A vacuum component of the universe must evolve*.

Colloquium :

14.03.2011 Anil Gangal on *Dynamics on fractals - From sub-diffusions to equivalents of clocks*.

The First Introductory School on Gravitational Wave Astronomy (ISGWA)



Participants and lecturers of the First Introductory School on Gravitational Wave Astronomy (ISGWA)

The first Introductory School on Gravitational Wave Astronomy (ISGWA) was organized by the IUCAA Resource Centre at the University of Delhi during December 13-24, 2010. There were about 75 participants (including 35 from outside Delhi), spanning the spectrum of students of bachelor of science, master of science and PhD in physics as well as engineering. The primary aim of the school was to expose students to the emerging and exciting research frontier of gravitational wave astronomy. The academic programme was divided into two parts: morning lecture sessions and afternoon hands-on sessions, with theory tutorials, data analysis computational tutorials and experimental sessions. The spectrum of topics covered during the morning sessions were general relativity, astrophysics, data analysis and interferometry. Teaching faculty included Alan Weinstein from LIGO-Caltech, B. S. Sathyaprakash from University of Cardiff, Sanjeev Dhurandhar from IUCAA, P. Dasgupta and Anand Sengupta from Delhi University, C. S. Unnikrishnan and A. Gopakumar from TIFR, Mumbai, K. R. Nayak from IISER-Kolkata, Archana Pai from

IISER-Thiruvananthapuram, and K. G. Arun from CMI, Chennai.

The afternoon hands-on sessions were designed to give first hand experience of the nitty-gritties of gravitational wave data analysis. The sessions involved computer simulations, and were conducted in GNU-Octave. The tutors were P. Ajith from Caltech, K. R. Nayak, A. Pai and A. Sengupta. The laboratory experimental sessions included simple demonstration of resonant bar detector, multi-stage vibration isolator model, magnetic levitation, and Fabry-Perot interferometer. The tutors included Suresh Doravari from LIGO-Caltech, G. Rajalaxmi, J. Fiscina and Dipankar Nath from TIFR, Mumbai, and Puneet Murthy, and Aseem Rastogi from Bangalore University.

The school was a grand success, in which the students participated enthusiastically discussing various scientific issues. Some of the students have kept in touch with the teachers after the school has got over, and are following up on the activities.

International Conference on Interstellar Dust, Molecules and Chemistry (IDMC-2011), November 22 – 25, 2011

IUCAA will organize an International Conference on Interstellar Dust, Molecules and Chemistry during November 22 - 25, 2011 at IUCAA. The interstellar medium is a treasure trove for the study of a wide variety of physical phenomenon. It also plays a crucial role in star and planet formation. Recent advances in observational, laboratory, theoretical studies have opened up several avenues of work, and made attractive by the possibilities of diverse interdisciplinary interactions. The conference intends to provide a platform for expert discussions and presentations with ample opportunities for young and motivated students and researchers to interact, and to take up challenging problems in this field. During the conference, there will be several invited review lectures, contributed talks and a poster session with ample opportunity to discuss and present results. Researchers

and youngsters interested in the field should apply by **May 31, 2011**. The abstracts may be submitted by **August 31, 2011**.

Conference e-mail: idmc2011@gmail.com

Conference Web Site:

<http://www.iucaa.ernet.in/~idmc2011>

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Conference on Wideband X-ray Astronomy : Frontiers in Timing and Spectroscopy



Participants and Lecturers of the Conference on Wideband X-ray Astronomy : Frontiers in Timing and Spectroscopy

An international Conference on “Wideband X-ray Astronomy: Frontiers in Timing and Spectroscopy” was held in IUCAA during January 13 – 16, 2011. The conference was attended by over 110 participants. About 30 participants were from overseas, representing many countries including the USA, UK, Netherlands, France, Germany, Spain, Italy, Poland, South Africa and Japan. The theme of the conference was chosen to be of particular relevance to **Astrosat**, the forthcoming Indian astronomy mission.

The participants were treated to a host of up-to-date reviews by international experts on wide-ranging subjects including Cataclysmic Variables, X-ray binaries, Active Galactic Nuclei, Clusters of Galaxies as well as transient sources and X-ray surveys in general. Extensive discussions were held regarding the future course of action in each of these areas, particularly in the context of **Astrosat**. The meeting opened with an overview of the **Astrosat** mission, and every subsequent speaker highlighted the role that **Astrosat** can play in advancing the respective areas.

In addition to the 40-odd lectures, about 40 poster papers were also presented at the meeting. The posters, contributed largely by young PhD students from all over India, showcased the ongoing work in the country in related fields, and attracted a lot of attention from everyone. Every evening, the poster presentation area witnessed a packed crowd of viewers and several hours of intense discussion.

In the final session of the meeting, a panel discussion was held to seek and consolidate the views of the participants on the priority science areas to be pursued with **Astrosat**, and the corresponding observing strategy to be adopted. A number of important suggestions emerged from this discussion.

X-ray transient sources were clearly among the most favourite, and a strong desire was expressed to have the scheduling as flexible as possible in order to enable extensive observations of such sources. It was remarked that any X-ray source that shows an intensity gradient of more than 0.5 Crab in 3-5 days presents an excellent opportunity, and such objects must be followed up densely. Fast timing of such sources over a wide energy band will be a key strength of **Astrosat**. For somewhat fainter transients, it was felt that a regular scan of the galactic bulge would be highly productive. **Astrosat** will also be able to make a major advance in the area of X-ray cyclotron line studies, provided that an accurate spectral calibration is possible. A programme of multi time-scale, multi-wavelength photometric and spectral monitoring of a few carefully selected Active Galactic Nuclei also received a strong support from the participants. The need for good photometric, spectroscopic and timing calibration was strongly emphasized, and it was recommended that **Astrosat** joins a campaign of multi-mission cross-calibration as soon as possible.

It was clear from the conference that the user community in India as well as in other countries is eagerly awaiting the launch of **Astrosat** with a keen scientific interest. The meeting concluded with a strong expression of goodwill to the **Astrosat** mission from all participants.

The conference was coordinated by Dipankar Bhattacharya.

A School on Recent Advances in Cosmology



IRC Data Centre being inaugurated by A. Basumajumdar, Vice-Chancellor, NBU.



Participants and Lecturers of the School on Recent Advances in Cosmology

A School on Recent Advances in Cosmology (SRAC-2011) was held during February 21-26, 2011 at IUCAA Resource Centre (IRC), Physics Department, North Bengal University (NBU), Siliguri. There were 30 participants from different institutes and universities in India, including research scholars of NBU and faculties from other colleges. The speakers of the school were T. Sourdeep, B. C. Paul, T. Raychaudhuri, S. Majumdar, S. Bharadwaj, L. Sriamkumar, and S. Mukherjee. The main objective of the school was to expose the Research Scholars to the recent research frontiers in cosmology. A number of lectures were delivered by the active workers in the field. The

main topics were overview of cosmology and structure formation, basic cosmology, inflation, density perturbation and observational cosmology including dark matter. The emerging area of research was also discussed thereafter.

IRC data centre was inaugurated by A. Basumajumdar, Vice-Chancellor, NBU on February 21, 2011. The participants of the school were present at the inauguration ceremony. The school was coordinated by T. Souradeep from IUCAA and B. C. Paul from NBU.

IUCAA Preprints

Listed below are the IUCAA preprints released during January to March 2011. These can be obtained from the IUCAA library (library@iucaa.ernet.in). The preprints can also be freely downloaded from <http://www.iucaa.ernet.in/~library/main.html>

Yuri Shtanov and Varun Sahni, *Generalizing the cosmic energy equation*, IUCAA-1/2011; Maryam Arabsalmani and Varun Sahni, *The Statefinder hierarchy: An extended null diagnostic for concordance cosmology*, IUCAA-2/2011; D. B. Vaidya and Ranjan Gupta, *Infrared Emission from the Composite Grains: Effects of inclusions and porosities on the 10 and 18 μm features*, IUCAA-3/2011; Naseer Iqbal, Mohammad Shafi Khan and Tabasum Masood, *Entropy changes in the clustering of galaxies in an expanding universe*, IUCAA-4/2011; S. V. Dhurandhar, *Gravitational wave astronomy- Astronomy of the 21st century*, IUCAA-5/2011; S. V. Dhurandhar, W.-T. Ni and G. Wang, *Numerical simulation of time delay interferometry for LISA with one arm dysfunctional*, IUCAA-6/2011.

Advanced Workshop on X-ray Astronomy



Participants and Lecturers of the Advanced Workshop on X-ray Astronomy

The Physics Department, Tezpur University, organized an Advanced Workshop on X-ray Astronomy during March 3 - 7, 2011. The workshop was sponsored by IUCAA, Pune. The aim of the workshop was to provide hands-on experience of data analysis to the participants. Amit Pathak, Tezpur University; Senorita Devi, Assam University; Soma Mandal, Taki College; S. Biswas, Assam University; and Rathin Sarma, provided technical assistance and helped the participants in the data analysis sessions. The participation was limited to 16 in order to provide individual attention for analysing X-ray data. The participants were from Guwahati University, and AV College, Guwahati, Swami Ramanand Teerth University, Nanded, Assam University, Silchar, Prince of Wales Institute, Jorhat, and Tezpur University. The workshop was inaugurated by A. Chaudhury, Pro-Vice Chancellor of Tezpur University. An introductory talk on X-ray Astronomy was given by G.

Dewangan. A popular talk on Black Holes was delivered by R. Misra. These were attended by students from various departments of the University. Followed by the talks, an interactive session between Physics students and Ranjeev Misra was organized.

The workshop was a huge success and by the end of the workshop, the participants had basic knowledge of analysing X-ray data. The participants learnt how to download and analyse data to obtain scientific information about the source. The workshop also allowed interaction between faculty members of the Physics Department and Scientists from IUCAA. The workshop was coordinated by Nilakshi Das, Physics Department, Tezpur University and Ranjeev Misra, IUCAA.

International Year of Astronomy 2009- State Level Camp for College Students

State Level Camp for College Students (SLCCS), initiated by Rajiv Gandhi Science and Technology Commission (RGSTC), Mumbai, Government of Maharashtra, and Catalyzed and supported by Rashtriya Vigyan Evam Prodyogiki Sanchar Parishad (RVSPS), DST, New Delhi was organised by IUCAA, Pune, during January 14 - 16, 2011. The camp was conducted in Manchar town in Pune district, which is about 65 kilometre from Pune on the Pune-Nasik highway. Thirty two students from Pune, Ahamadnagar, Thane, Mumbai, Raigad, Ratnagiri, Satara, Solapur, Sangli, Sindhudurg and Kolhapur, were invited to participate in the camp.

Ranjan Gupta inaugurated the camp and gave a lecture on Large Optical Telescopes. Vijay Mohan and Chaitanya V. Rajarshi gave lectures on ***A Journey Through the Universe***. J. K. Solanki (NCRA) talked on Giant Metrewave Radio Telescope and Sudhanshu Barway (South African Astronomical Observatory) talked on Virtual Observatories and gave hands-on demonstrations. The students were also invited to attend the lecture by Giuseppina Fabbiano (Senior Astrophysicist at the Harvard-Smithsonian Center for Astrophysics, Cambridge, USA), on The Chandra X-ray Observatory.

The students observed the passage of the Hubble Space Telescope and the International Space Station. They also observed and recorded occultation of 47 Ari (mag 5.8) by the moon. They were given firsthand experience on using a 150 mm Newtonian telescope for observations of Orion nebula, Jupiter, Saturn, Venus, Omega Centauri, M13, M44, M67, binary stars Alcor and Mizar.

An astronomy quiz competition was conducted for the participants. The first prize was won by Pankaj Udayshankar Yadav. Second and Third prizes by Vishar Vijay Bhogate and Sujay Sudhir Olkar, respectively.

Nilesh Pokharkar (at IGO) assisted in conducting the camp. Samir Dhude and Arvind Paranjpye coordinated the camp. They interacted with the students and gave them lectures and hands-on practice on using astronomical telescope and conducted interactive session with students on debunking astrology.

Visitors (January - March 2011)

Deatrick Foster, P.C. Agrawal, D.V. Ahluwalia, Fayaz Ahmad, Diego Altamirano, G.C. Anupama, Abhay Ashtekar, B. Asmita, Sudhanshu Barway, Tomaso Belloni, Naseer Iqbal Bhat, Nilay Bhat, Vasudha Bhatnagar, Sandip K. Bhattacharya, Suman Bhattacharya, Sudip Bhattacharya, Debbijoy Bhattacharya, Subir Bhattacharya, Archana Bora, David Buckley, Vladimir Burdyuzha, Sherry Chabra, Sandip Chakrabarti, Manoneeta Chakraborty, Susmita Chakravorty, Poonam Chandra, Phil Charles, Indranil Chattopadhyay, Asis Kumar Chattopadhyay, Bhag Chand Chauhan, Rabin Chhetri, Nigel Collett, Pratik Dabhade, B.P. Dakshayanai, Himadri Sekhar Das, Santabrata Das, Abhay Dashrath, Ghanshyam Date, Broja Datta, Laurence David, Andrew DeBenedictis, Dipak Debnath, Jincy Devasia, Suraj Dhiwar, Chris Done, Moti Ram Dugair, Jibitesh Dutta, Martin Elvis, Guiseppina Fabbiano, Andrew Fabian, K.F. Fency, Madhuri Gaikwad, Poshak Gandhi, Tom Gehrels, A. Gopakumar, N.S. Gopinath, Maheswar Gopinathan, Aruna Goswami, Matteo Guinazzi, Shashikant Gupta, Anuradha Gupta, K.P. Harikrishnan, E.P.J. van den Heuvel, Mohammed Imran, K. Indulekha, Nazma Islam, Yoichi Itoh, Joe Jacob, Chetana Jain, Marykutty James, K. Jeena, V. Jithesh, Santosh Joshi, Mohit Joshi, Nidhi Joshi, Anil Kakodkar, Debal C. Kar, Bidya Kar, H.K. Kaul, Romesh Kaul, Rizwan Shahid Khan, Michiel van der Klis, Tilak Kotoch, Marissa Kotze, Ramesh Koul, Arun Kumar, Ranjan Kumar, Prashant Kumar, Pavan A. Kumar, M.L. Kurtadikar, Kiran Lakhchaura, Craig Mackay, Ashish Mahabal, Chandreyee Maitra, K. Malarmani, Ritam Mallick, Julien Malzac, Soma Mandal, Samir Mandal, Bari Maqbool, Tabasum Masood, Smita Mathur, S. Mazumdar, Ian McHardy, Biman Jyoti Medhi, Mariano Mendez, Andrea Mignone, K.M. Minu, Prashant Mohan, Santanu Mondal, Koji Mukai, Arunava Mukherjee, Banibrata Mukhopadhyay, C. Bala Murugan, Ramamurthy K. Naidu, Sachindra Naik, Ramesh Narayan, Wei-Tou Ni, Devendra Ojha, Feryal Ozel, Srikar Paavan, Partha Sarathi Pal, Mahadev Pandge, Sachin Pandit, R. Pandiyan, Padmakar S. Parihar, Isabelle Paris, Dipankar Paul, Biswajit Paul, B.C. Paul, Devraj Pawar, Ninan Sajeeth Philip, M. Pitchaimani, T.P. Prabhu, Pragati Pradhan, P. Prakash, W.V. Eswar Prakash, Pratyush Pranav, Farook Rahaman, Andry Rajoelimanana, M.C. Ramadevi, N. Hari Prasad Rao, J.D. Rao, P. Vivekananda Rao, C.D. Ravikumar, Saibal Ray, Ronald Remillard, Martin Roth, Rupak Roy, Ashim Roy, Rajib Saha, Anirban Saha, Sanjit Sahu, Inder Sain, Saumyadip Samui, Tamal Sarkar, S. Seetha, Anjan Ananda Sen, Anand Sengupta, P. Shalima, Kiran Shanker, S.K. Sharma, Tejaswita Sharma, Dipak Singh, Kulinder Pal Singh, Vireesh Singh, Chandra Singh, Satish Sonkamble, Firoza Sutaria, Ryoko Tanii, Shruti Tripathi, Pranjal Trivedi, Yuusuke Uda, A.A. Usmani, Santosh Vadavale, N.D. Vagshette, D.B. Vaidya, Hum Chand Varma, M. Vivek, Joern Wilms, Shobhit Yadav, J.S. Yadav and Andrzej A. Zdziarski.

A group of six students from Presidency College, Kolkata and another group of 6 students from West Bengal State University visited IUCAA during January 20-30, 2011 as a part of a special programme arranged by Anirban Saha, Visiting Associate of IUCAA. A group of seven students and a teacher from M.P. Birla Institute of Fundamental Research, Kolkata visited IUCAA during March 12-16, 2011 and a group of 10 students and a teacher from University of Mumbai visited IUCAA during February 14-19, 2011.

Visitors Expected

April :

Sunil Chandra, PRL, Ahmedabad; Aruna Goswami, IIA, Bangalore; Bala Iyer, RRI, Bangalore; Kanti Jotania, MS University of Baroda; Soma Mandal, Taki Government College, West Bengal; Anand Narayanan, IISST, Thiruvananthapuram; Sheetal Kumar Sahu, Pt. Ravishankar Shukla University, Raipur; B.P. Sarmah, Tezpur University; Anvar Shukurov, University of Newcastle, UK; Firoza Sutaria, IIA, Bangalore; Mohit Tanga, IISER, Chandigarh; Thakulkar, HBCSE, Mumbai; and Shruti Tripathi, Gorakhpur University.

May :

Ritabrata Biswas, Jadavpur University; Subenoy Chakraborty, Jadavpur University; Mamta Dahiya, S.G.T.B. Khalsa College, Delhi; Ujjal Debnath, BESU, Howrah; Partha Ghose, CAPSS, Kolkata; Sarbari Guha, St. Xavier's College, Kolkata; Haroon Aly, NRIAG, Cairo, Egypt; Ishwar Bhola, BRA Bihar University, Muzaffarpur; Joe Jacob, Newman College, Kerala; Kanti Jotania, MS University of Baroda; B.S. Kushvah, Indian School of Mines, Bihar; Soma Mandal, Taki Government College, West Bengal; Nairwita Mazumder, Jadavpur University; Prashant Pathak, IISER, Thiruvananthapuram; Madhav K. Patil, STRM University, Nanded; B.C. Paul, University of North Bengal, Siliguri; Shantanu Rastogi, DDU Gorakhpur University; Ranjan Sharma, P.D. Women's College, West Bengal; Pranjal Trivedi, Sri Venkateswara College, Delhi; A.A. Usmani, AMU, Aligarh; Piyali Khatua, BESU, Howrah; Kishor Ram, Indian School of Mines, Dhanbad; Mahadevappa Swami, SRTM University, Nanded; and Sanjay Jhingan, JMI, Delhi.

June :

Saiyad SK. Ali, Jadavpur University; Rabin Chhetri, Sikkim Govt. College, Gangtok; Rekha Jaiswal, Hindu Post-Graduate College, Ghazipur; Mehedi Md. Kalam, Aliah University, Kolkata; K.D. Patil, B.D. College of Engg., Wardha; Anirudh Pradhan, Hindu Post-Graduate College, Ghazipur; P.K. Samal, Utkal University, Bhubaneswar; Paniveni Udayashankar, NIE Institute of Technology, Mysore; Sneha Deep Ata, St. Xavier's College, Kolkata; Jyoti Prasad Deka, Guwahati, Assam; Sukanta Bose, Washington State University, USA; and Anjan Dutta, University of Delhi.

Long term visitors

Pushpa Khare (till January 2014), R.K. Tikekar (till May 2011), Josep Pons (till May 2011).

Know Thy Clouds - 5

Alto cumulus: Middle level clouds in heaps

Alto in the name of these clouds may be a slight misnomer as altus in Latin means high, but of course, these clouds form heaps or globular masses and are cumulus type. The alto cumulus clouds are middle level clouds at about 2000 m above the ground level and can extend up to 7000 m.

Alto cumulus, like cumulus (*KTC -2 Khagol No. 83*) clouds usually form by convection. These clouds are dense, look white or gray. The clouds do have dark patches on one side that helps us to separate these from another similar looking clouds cirrocumulus, forming at much higher heights.

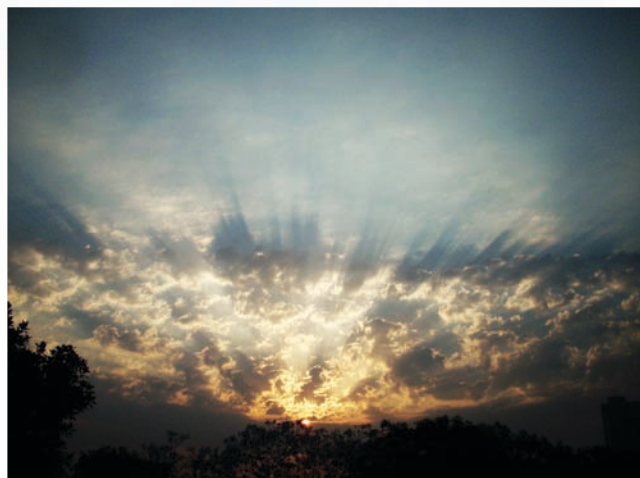
Alto cumulus also takes the form of wavy and rounded masses or rolls. The presence of alto cumulus clouds on a warm and humid summer morning is a likely indication of thunderstorms or unsettled weather later in the day.

The temperatures inside the Alto cumulus cloud is minus 10 degree celsius and consists of super-cooled (or under-cooled) water droplets but also carry some ice crystals. This is an important property of these clouds. Super-cooling is the process of lowering the temperature of liquid or gas below its freezing point without becoming solid. Presence of seed crystal or a nucleus is needed to form a crystal structure in liquid below its freezing point.

Alto cumulus clouds also come in wide range of forms. One interesting form is alto cumulus lenticularis, for these clouds in isolation resemble a lentil seed. These clouds are often responsible for mistaken identification by people reporting sighting of UFOs. Though the alto cumulus clouds are associated with convection, they give only minor bumps when flying through them, but not so with alto cumulus lenticularis, and aviators avoid these clouds.

Arvind Paranjpye

Name	Alto cumulus
Short form	Ac
Temperature	-10°C
Height	2000m – 7000m
Symbol (Graphical Representation)	
Thin and semi-transparent	☁
Thin patches	☁
Band and thickening	☁
Double layered	☁
Spreading from cumulus	☁
Tufts or turrets	☁



Alto cumulus clouds seen over the eastern horizon of IUCAA



Khagol (the Celestial Sphere) is the quarterly bulletin of IUCAA
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