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A Quarterly Bulletin of the Inter-University Centre for Astronomy and Astrophysics (An Autonomous Institution of the University Grants Commission)

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International Virtual Observatory Alliance (IVOA) Interoperability Meeting and Small Projects Meeting

The Interoperability (IO) meeting of the International Virtual Observatory Alliance (IVOA) took place in IUCAA during September 27-29, 2004. The meeting was jointly organised by IUCAA and Persistent Systems Private Limited (PSPL), Pune, who are partners in the Virtual Observatory-India (VO-I) project, which is partially funded by the Ministry of Information and Communications Technology. The IO meetings are held about twice a year in important Virtual Observatory centres in different countries, and their aim is to provide a platform for discussion, planning and collaboration between people working in different Virtual Observatories. The Working Groups (WG) of the IVOA, which were represented in the meeting were Registry, Uniform Content Descriptors, Data Model, Data Access Layer, Virtual Observatory Query Language, Grid and Web services and Global Grid Forum. One or more sessions of each WG were held during the meeting, with a number of presentations being made in each session. There were a small number of plenary talks, summarizing all the discussions. Working papers emerging from the sessions will be posted on the IVOA website. These will provide directions for further development in the concerned areas.

A Small Projects Meeting of the IVOA took place at IUCAA during September 30–October 1, 2004, following the Interoperability meeting. The aim of these meetings is to provide a forum for the relatively small Virtual Observatory projects in the Asia-Pacific region

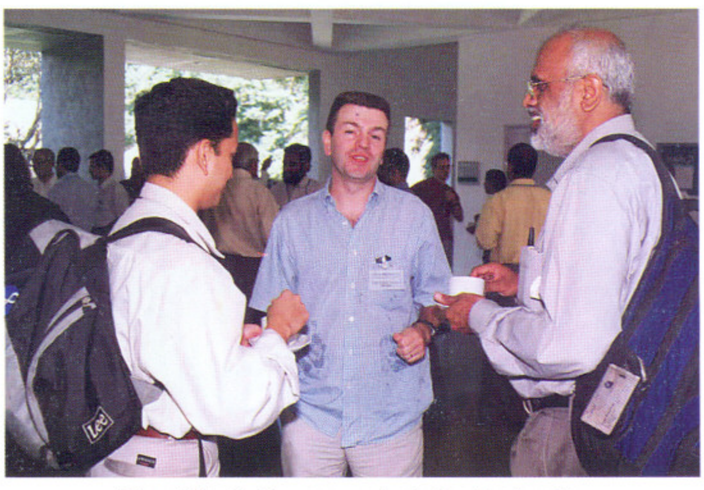
Speakers getting ready for their talks

to discuss the work undertaken by them, the products made ready and plans for the future. The first such meeting was held in Beijing in November 2003 and the meeting at IUCAA has been the second one in the planned series. The specific aim of the meeting at IUCAA was to bring together Observing Facilities, which have been recently completed or will be ready in the near future, and people working on VO related projects. From India, there were presentations on the Himalaya Chandra Telescope (HCT), The TAUVEX Mission and projects undertaken by VO-I. There were also presentations by VO projects from Australia, China and Japan and plenary talks and discussion sessions on science from the VO and the progress of VO from development to deployment.

A public lecture by Francoise Genova, Observatoire de Strasbourg, Strasbourg was organised at the Chandrashekhar Auditorium, IUCAA and another one by Peter Quinn, European Southern Observatory, Munich, in the Devang Mehta Auditorium at PSPL. About fifty astronomers and software engineers from abroad, and a similar number from India attended both the IVOA meetings. A.K. Kembhavi was the coordinator of these meetings.

Participants of the IVOA meetings

Participants at a lecture session



One of the lighter moments during the breaks

Space UK Exhibition

A SpaceUK exhibition on the solar system and its exploration, was kept open at IUCAA for the people during August 1-8, 2004. The exhibition has been commissioned by British Council. The United Kingdom has played an important role in the solar system missions, both by developing spacecraft and instrumentation and by interpreting the results. The SpaceUK exhibition highlighted on those missions and the future UK led exploratory missions to the Moon, a comet, Mars, Venus and Saturn as well.

The exhibition looked at the key missions regarding solar system exploration and described some of the challenges that scientists and engineers face in designing a spacecraft. With striking graphics and a walk-through tunnel display, SpaceUK delved into the science behind the missions and the questions that will be answered about the planets, comets and asteroids. A scaled down model of the solar system hung on a stand gave an idea of comparative sizes of the planets and the Sun, and the distances in the solar system.

Everyday, screening of 'The IUCAA Story,' 'Taryanchi Jeevangatha I & II (*Life cycle of stars*),' 'Powers of Ten' was also done one after the other during the day time, and during August 2-7 every evening, a popular talk or a scientific film was arranged at the Chandrasekhar Auditorium. Pandit Vidyasagar, from the Department of Physics, Pune University (*Brain: Known and Unknown*), Murali Sastry from National Chemical Laboratory (*Nanoscience and the Next Industrial Revolution*), and Tarun Souradeep from IUCAA (*Unraveling Our Universe*) gave popular talks.

In spite of heavy rains, students, amateurs and enthusiasts turned up in thousands to view the exhibition. Many of the curious students took out their notebooks to take down the information about various missions. Apart from the information content, viewers found the exhibition in the form of tunnel display very impressive.

The exhibition is currently in India and will be here till November 2004. It was inaugurated at the Goa Science Centre on July 12, 2004. After Pune, the exhibition moved on to Mumbai, and will further move on to Vadodara, Gandhinagar, Delhi, Bhopal, Kurukshetra and Kolkata.

Model of Solar System

The school students at the exhibition

IUCAA-NCRA Graduate School Courses

The IUCAA-NCRA Graduate School (conducted jointly with the National Centre for Radio Astrophysics (NCRA), Pune) is divided into two semesters (four terms) spread over one year. Each term is of roughly eight weeks duration. During the Graduate School, the Ph.D. students (Research Scholars) are taught relevant advanced courses in Physics and are also introduced to courses in Astronomy and Astrophysics (A & A). The Graduate School structure is given below. The number of teaching hours is shown in brackets after each course.

Semester I, Term I, From August second week to October first week.

01. Methods of Mathematical Physics I (21)

02. Introduction to Astronomy and Astrophysics I (14)

03. Electrodynamics and Radiative Processes I (14)

04. Quantum and Statistical Mechanics I (14)

Semester I, Term II, From October third week to December second week.

05. Methods of Mathematical Physics II (14)

06. Introduction to Astronomy and Astrophysics II (14)

07. Electrodynamics and Radiative Processes II (14)

08. Quantum and Statistical Mechanics II (14)

Semester II, Term I, From January first week to February fourth week.

09. Astronomical Techniques I (14)

10. Galaxies: Structure, Dynamics and Evolution (21)

11. Extragalactic Astronomy I (21)

Semester II, Term II, From March third week to May second week.

12. Astronomical Techniques II (14)

13. Interstellar Medium (14)

14. Extragalactic Astronomy II (14)

15. Project Work (During May-July).

16. Topical Course (for earlier batch of students) (< 21)

Syllabus for the Graduate School Courses

1. The courses are designed, emphasizing the aspects which are directly relevant to A &A. It is assumed that unnecessary repetition of material which is already taught at M.Sc. is avoided.

2. The syllabus provides enough avenues for topics which are of "local interest" to be included in the graduate school. This is necessary so that graduate students coming out of IUCAA/NCRA, not only have a comprehensive grasp of the A & A but are also aware of the key research areas in which these two institutions are concentrating at present.

If any of the Research Scholars from Indian universities/colleges are interested in attending any of these courses, they may contact: The Coordinator, Core Programmes, IUCAA.

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Learning Science through Activities and Toys

Children Learn Best Through Doing

Before children can understand a thing, they need experience: seeing, touching, hearing, tasting, smelling; choosing, arranging, putting things together, taking things apart etc.; experimenting with real things.

Old-time school teaching used only words, and the teachers thought children knew something if they could repeat it. Now we know better. To reach practical understanding we do not need to use many words with young children.

Children are clever. They learn a lot, without being taught. The greatest skill – to be able to talk, to communicate are learnt outside school. In the classroom, it's the children who need to talk the most. Unfortunately, it is the teacher who does most of the talking!

Everything Has A History

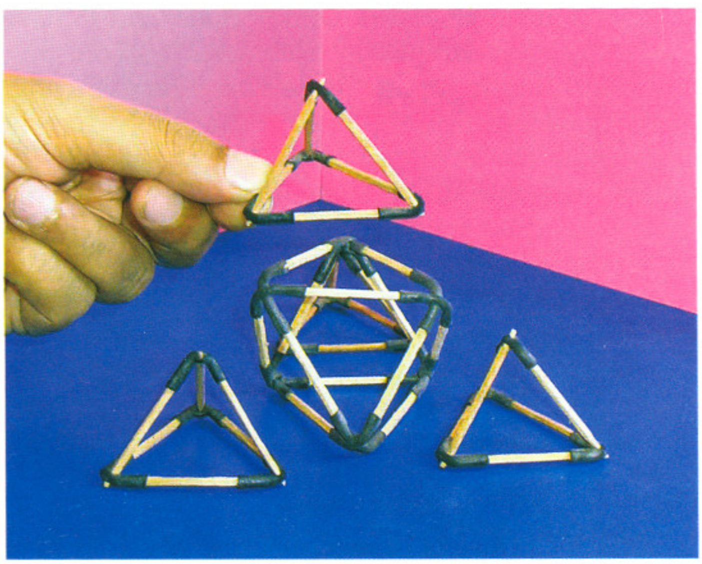
Many nations were totally devastated during the Second World War. Later on, these countries were able to build schools but had no money to set up science laboratories. At the behest of UNESCO, J.P. Stephenson, Science Master at City of London School prepared a book on science activities titled *Suggestions for Science Teachers in Devastated Countries*. This fully illustrated book showed teachers how to make their own apparatus from simple, everyday materials at little cost.

This book got a thumping response. It was also very successful in other regions, where there had been little or no equipment for science teaching. The book was considerably expanded with suggestions for making simple equipment and for carrying out experiments using locally available materials. In 1956, came the first edition of the *UNESCO Source Book for Science Teaching* which, periodically revised, and updated, has been translated into more than thirty languages, reprinted scores of times and has sold several million copies. The *New UNESCO Source Book for Science Teaching* has been a bible for science teachers' since 1973. It has been translated into many languages and very favourably accepted world-wide. In 1963, this book was translated and printed in Hindi by the Publication Division. It is sad that this book is not available in all Indian languages.

History changed on October 4, 1957, when the Soviet Union successfully launched the Sputnik. As a technical achievement, Sputnik caught the world's attention and the American public off-guard. That launch ushered in new political, military, technological, and scientific developments.

The Sputnik shock shook the US and UK science establishment. Several new initiatives were taken to make science teaching more interesting. The Nuffield Science Programme in the UK in the early 60's based itself on the discovery approach. Science through activities became the buzzword.

The Hoshangabad Science Teaching Programme (HSTP) in India, though inspired by the Nuffield philosophy had to reinvent all the hardware to suit local conditions. This programme covered over 1000 schools in the villages of Central India. The idea was to critically look at local resources and find possibilities of doing innovative science using local, low-cost, easily accessible material. The *Matchstick Mecanno* was used successfully to learn geometry and three-dimensional shapes. It used bits of cycle valve tubes and matchsticks to make an array of 3D structures.



Matchstick Models

The programme recycled a lot of consumerist waste to make amazing teaching aids. The *Film Can Balloon Pump* was made using a piece of old bicycle tube, two film cans and bits of sticky tape for valves. With this pump children could inflate and pop a balloon. This pump was low cost – did not burn a hole in the pocket. It was fun and exhilarating science.

Balloon Pump

String and Sticky Tape Experiments

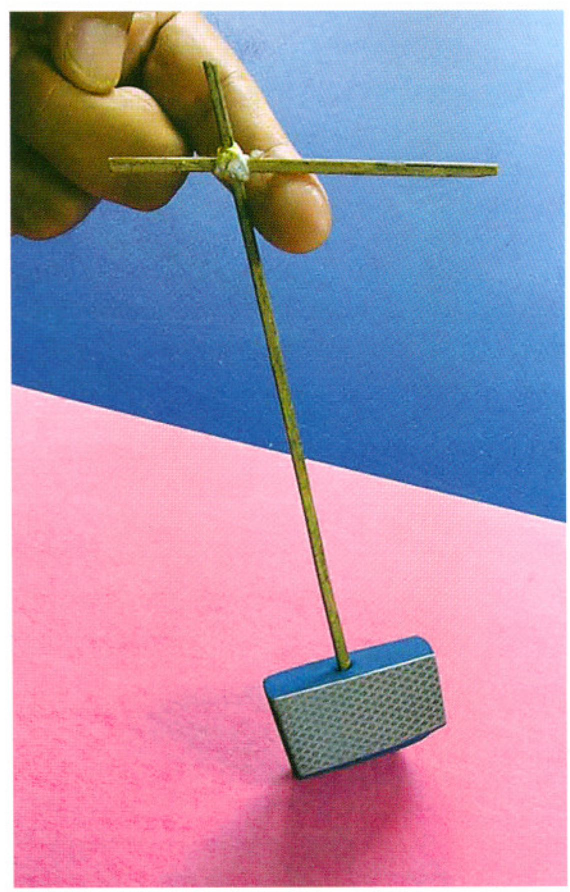
We live in a vicarious age. We often experience the world through TV rather than touching and feeling ourselves. Physics is an experimental science and only by doing "hands-on" experiments, messing around with equipment will you get a feel of it. Most physics gear sold to schools is too expensive to allow students to work with it alone, and to have the teacher hovering by is inhibiting. To avoid this, the equipment must either be very strong, unbreakable, in fact, so cheap it can be replaced at little cost. The *String and Sticky Tape Experiments* column was introduced in the magazine *The Physics Teacher* in the early 80's. It showed experiments using the simplest, least expensive materials. The materials could be purchased at the nearest store – you did not need anything expensive – not even a stopwatch. All you needed were common rubber bands, cello tape, Styrofoam or paper cups, string, drinking straws, glass marbles, plastic ruler, coins, pencil, paper and scissors.

In 1905, the father of Russian popular science, Yakov Pereleman (1882-1942) wrote *Physics for Fun*. He showed that children could use standard coins – roubles and kopecks as standard weights. It is sad that the chapter on *weight* in most Indian books starts not with coins (which are accessible to every child), but with a picture of a fractional weight box! (which most children will never see in their whole life).

Toys and Trinkets

Toys have been used successfully to demonstrate principles of physics. Most inspiring physics teachers have their pet toys hidden away in drawers, cabinets and pant pockets. They include things like the dunking bird, gyroscopes, yo-yo's, a tippy-top, propeller on a notched stick, Newton's cradle, slinky and coupled pendulums. Most toys have an advantage over conventional demonstration equipment in their relatively low-cost and the fact that children relate well to them. Unfortunately, most toys are not made for repeated use and that they are often no longer available when one looks for replacements!

Some traditional toys can be used to great advantage in a science class. It is unfortunate that science teaching ignores traditional toys. *The Joy of Making Indian Toys* by Sudarshan Khanna, documents over a hundred toys

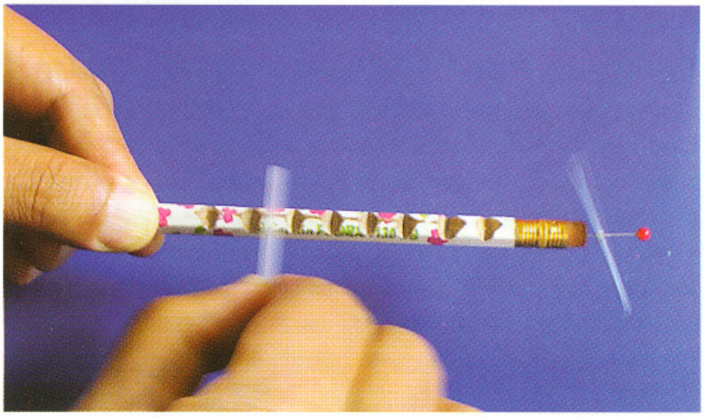


Sudarshan Chakra

which have been made by Indian children for generations – much before the currently popular toys like the Barbie and He Man made there debut. Traditional toyes are R & D for hundreds of years. Generations of children have made them and perfected them. The *Sudarshan Chakra* is a classic example. It is made from a coconut broomstick, some thread and a piece of slipper rubber. It costs almost nothing and can be used to demonstrate the force of rotation. Every child – even the poorest could afford and play with it.

The Notched Pencil

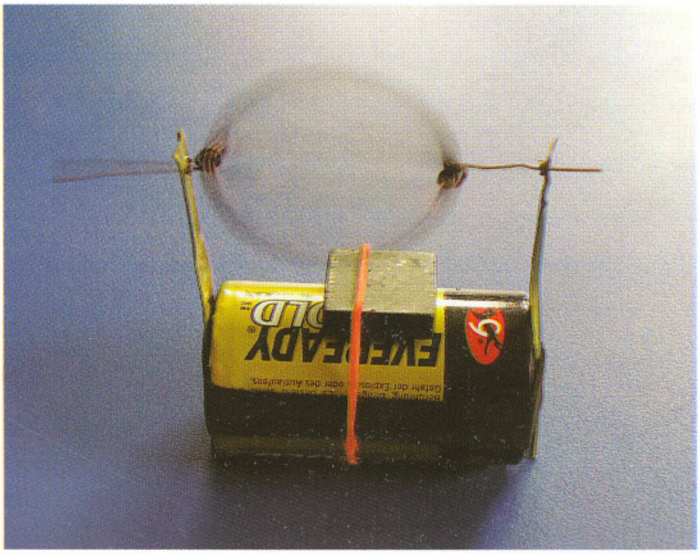
another traditional toy has now become a darling of science teachers. It can be made in less than five minutes. You just have to make a few notches on a pencil. Then insert a fan on a paper pin at the end of the rubber. If you now rub the notches with an old ball pen refill the fan magically rotates! Many people think that it has to do something with airflow or static electricity. Far from it. This toy is based on vibrations. The physics behind it is non-trivial and quite sophisticated. Several learned research papers have been written on the working of this toy.



Notched Pencil

Simple Motor

This simply is the simplest motor on earth! The most expensive thing in this motor is the torch battery! The other parts are a broad rubber band from an old bicycle tube, a metal strip (broken stove pin), a cheap ferrite magnet and one meter of motor rewinding wire. The rubber band keeps the two metal strips in contact with the battery terminals. There is 1.5 volts across the metal strips. If you connect them with a torch bulb, it will glow. Wind the copper wire on an old battery. There will be about 10-12 loops in the coil. Tie the ends on the



Simple Motor

coil (this prevents the loops from separating). Then straighten them so that they jut out diametrically opposite each other. If you now put the ends of the coil in the holes of stove pins no current will flow through the coil (because both the ends are coated with insulation varnish). Now scrape of all the varnish from one end (this whole end will be shining copper). On the other end, scrape the varnish only from three sides, leaving the insulation intact on one side. The little strip of insulation acts like a switch. This amazing "brush" or "commutator" switches the current on and off to the coil in every single rotation.

After putting the coil in the holes of the metal strips you will have to "kick start" it. Once it gets going, it will keep rotating until the battery drains off! Children have loads of fun making this motor. They do a lot of experiments with it, too. What happens if the length of wire is double? Or half? What happens if the wire is thicker, thinner? What happens if you change the cross-section of the coil? What if you add another battery, or bring another magnet on top? There is so much in it to discover for an inquisitive child.

Balancing Beam

The Balancing Beam is another remarkable experiment. This involves the balancing of 12 large nails (10 cm) on the tip of another nail. This is easily done. First put one nail on the table. Then put 10 nails across it – 5 heads facing one way, and 5 the other. Then place another nail along (on top) of the first nail. The whole assembly of 11 nails can now be lifted with both hands and placed

Balancing Beam

on the head of the 12th nail which is vertically nailed in a piece of wood. The great thing about this self-supporting roof is the simplicity of assembly. It can be done anywhere with very little money.

IUCAA's Children Science Centre

The Inter University Centre for Astronomy and Astrophysics – IUCAA's Children's Science Centre has recently gone on stream. Unlike science museums, it is conceived of as a Children's Activity Centre. Children learn best when they see science in simple things around them. Every day 50 children from one particular school come to the centre and spend 4 hours making toys that spin, fly, whistle, jump, and hop. They make "action" toys – for all children are attracted to dynamic toys. Children learn to fold a dozen different caps using old newspapers (the cheapest paper). They learn geometry by paper folding – making the rotating hexa-flexagon using an old photocopy paper! The ability to make and improvise experiments with almost zero-cost equipment holds great promise for every child in this resource-starved country. The message is loud and clear – school kids can do great science experiments at very little cost. The great pioneers of science did their work with very simple equipment. It is possible, therefore, to follow their footsteps and learn to do scientific thinking without fancy and elaborate apparatus. After all, the student's mind is the most expensive piece of equipment involved!

If you want to encourage a child to explore science, you first have to abandon a few traditional ideas you may have about scientific learning. Ask most people what a science toy is, and you'll get the obvious answers: microscopes, magnifying glasses, and prisms. Any toy can end up being used for scientific exploration, whether it is Silly Putty, toy gliders, balloons, mini-cars, or action figures. The nicest thing about using toys for teaching science is that children can mess around with them freely, without being reprimanded for breaking precious equipment!

References

String and Sticky Tape Experiments – Ed R.D. Edge (AAPT)

A Potpourri of Physics Teaching Ideas – Ed. Donna A. Berry (AAPT)

Preparation for Understanding – Keith Warren (Unicef)

The Flying Circus of Physics – Jearl Walker

Clouds in a Glass of Beer – Craig F. Bohren

700 Science Experiments for Everyone – compiled by UNESCO (Doubleday)

365 Simple Science Experiments with Everyday Materials – Richard Churchill (Sterling)

Mr. Wizard's 400 Experiments in Science – Don Herbert

UNESCO Source Book for Science in the Primary School, Harlen & Elstgeest

VSO Science Teacher's Handbook, Andy Byers, Ann Childs, Chris Lane.

Dynamic Folk Toys, Sudarshan Khanna (NID, India)

The Historian's Toybook, E.P. Provenzo, A.B. Provenzo, P. Zorn

Low-cost, No-cost Teaching Aids, Mary Ann Dasgupta (NBT,India)

Riddles in a Teacup, Partho Ghosh, Dipankar Home (Rupa, India)

Soap Bubbles, C.V. Boys (Vigyan Prasar,India)

The Chemical History of a Candle, Michael Faraday (Vigyan Prasar, India)

The Story of Physics, T. Padmanabhan (Vigyan Prasar, India)

Insect World of J. Henri Fabre (Vigyan Prasar, India)

Ten Little Fingers, Arvind Gupta (NBT, India)

The Joy of Making Indian Toys, Sudarshan Khanna (NBT, India)

http://www.vigyanprasar.com/

www.exploratorium.edu/

http://www.frontiernet.net/~docbob/

http://www.cdli.ca/sciencefairs/

http://www.hhmi.org/coolscience

www.hunkinsexperiments.com/

http://sciencefairproject.virtualave.net/

http://www.exo.net/~pauld/ (Paul Doherty homepage)

http://www.learner.org/exhibits/parkphysics/bumpcars2.html

http://www.iucaa.ernet.in/~scipop/

http://arvindguptatoys.balasainet.com

www.nsta.org/

IUCAA Preprints
(July-September 2004)

Listed below are the IUCAA preprints released during July-September 2004. These can be obtained from the Librarian, IUCAA (library@iucaa.ernet.in).

Sudhanshu Barway and S.K. Pandey, *HD 52452: New BVRI photometry*, IUCAA-23/04; Sudhanshu Barway, S.K. Pandey and Padmakar Singh Parihar, *BVR photometry of a newly identified RS CVn binary star HD 61396*, IUCAA-24/04; Ng. Ibohal, *Rotating metrics admitting non-perfect fluids in General Relativity*; IUCAA-25/04; Ng. Ibohal, *On the variable-charged black holes embedded into de Sitter space: Hawking's radiation*, IUCAA-26/04; Ujjal Debnath, Asit Banerjee and Subenoy Chakraborty, *Role of modified Chaplygin gas in accelerated universe*, IUCAA-27/04; Anirudh Pradhan, Anil Kumar Yadav and Lallan Yadav, *Generation of Bianchi type V cosmological models with varying L-term*, IUCAA-28/04; Anirudh Pradhan, Kashika Srivastava and Amrit Lal Ahuja, *Nonsingular spherical models with a variable cosmological term*, IUCAA-29/04; Prasad Subramanian and Peter A. Becker, *Noise storm continua: power estimates for electron acceleration*, IUCAA-30/04; Anirudh Pradhan and Purnima Pandey, *Some Bianchi type I viscous fluid cosmological models with a variable cosmological constant*, IUCAA-31/04; Massimo Tinto and Sanjeev V. Dhurandhar, *Time-delay interferometry*, IUCAA-32/04; Jeremiah P. Ostriker and Tarun Souradeep, *The current status of observational cosmology*, IUCAA-33/04; Hum Chand, Patrick Petitjean, Raghunathan Srianand and Bastien Aracil, *Probing the time-variation of the fine-structure constant: Results based on Si IV doublets from a UVES sample*, IUCAA-34/04; M. Sami, N. Savchenko and A. Toporensky, *Aspects of scalar field dynamics in Gauss-Bonnet brane worlds*, IUCAA-35/04; M. Sami and N. Dadhich, *Unifying brane world inflation with quintessence*, IUCAA-36/04; Shinji Tsujikawa, M. Sami and Roy Maartens, *Observational constraints on braneworld inflation: the effect of a Gauss-Bonnet term*, IUCAA-37/04; Shinji Tsujikawa and M. Sami, *A unified approach to scaling solutions in a general cosmological background*, IUCAA-38/04; Jean-Francois Dufaux, James E. Lidsey, Roy Maartens and M. Sami, *Cosmological perturbations from brane inflation with a Gauss-Bonnet term*, IUCAA-39/04; M. Sami and V. Sahni, *Quintessential inflation on the brane and the relic gravity wave background*, IUCAA-40/04; Mohammad R. Garousi, M. Sami and Shinji Tsujikawa, *Cosmology from rolling massive scalar field on the anti-D3 brane of de sitter vacua*, IUCAA-41/04; B.C. Paul and M. Sami, *A note on inflation with tachyon rolling on the Gauss-Bonnet brane*, IUCAA-42/04; M. Sami and Alexey Toporensky, *Phantom field and the fate of the universe*, IUCAA-43/04.

Seminars

8.7.2004 Arnab Rai Choudhuri on *Why do millisecond pulsars have weaker magnetic fields compared to ordinary pulsars?*; 12.7.2004 Somak Raychaudhury on *The evolution of galaxies in small groups*; 20.7.2004 Srinivas R. Kulkarni on *The central engines of gamma-ray bursts, x-ray flashes and supernovae*; 30.7.2004 Susmita Chakravorty on *Compton drag model for gamma ray bursts*; 30.7.2004 Gaurang Y. Mahajan on *The Casimir effect*; 30.7.2004 Tapan Naskar on *Measurement strategies for the popularization measurement for brown dwarfs*; 30.7.2004 Saumyadip Samui on *Reionization of the universe*; 5.8.2004 Amrit L. Ahuja on *Study of pulsar dispersion measure*; 5.8.2004 Hum Chand on *Probing the cosmological variation of fine-structure constant: results based on VLT-UVES sample*; 5.8.2004 Atul Deep on *Near Infrared PICNIC imager: A progress report*; 5.8.2004 Sanjit Mitra on *Efficient data analysis strategy for the detection of gravitational waves from inspiraling binaries: Chebyshev interpolation*; 5.8.2004 Anand S. Sengupta on *Performance of the EHS pipeline on LIGO-S2 data*; 10.8.2004 B.S. Sathyaprakash on *Gravitational wave observations: current status and future prospects*; 19.8.2004 Sivarani Thirupathi on *Discovery of an L Subdwarf and a lead rich star*; 30.8.2004 Vijay Mohan on *Search for baryonic dark matter in the milky way*; 21.9.2004 K. Narayan on *Closed string tachyon condensation: Orbifold singularities*.

Special Relativity Centenary Meeting

A day's meeting will be held at IUCAA on January 2, 2005, to commemorate 100 years of Einstein's Special Relativity. The programme will consist of popular lectures by four eminent scientists.

Welcome to the IUCAA Family

IUCAA is happy to announce the selection of the ***Fifteenth Batch of Visiting Associates***. The Visiting Associateship is for a tenure of three years beginning July 1, 2004.

Extension to the Twelfth Batch of Visiting Associates:

- G. Ambika, Maharajas College, Kochi.
- Narayan Banerjee, Jadavpur University.
- Subenoy Chakraborty, Jadavpur University.
- Sarbeswar Chaudhuri, Gushkara Mahavidyalaya, Burdwan.
- Sushant G. Ghosh, Birla Institute of Technology and Sciences, Pilani.
- K.P. Harikrishnan, The Cochin College, Kochi.
- Chanda J. Jog, Indian Institute of Science, Bangalore.
- Kanti R. Jotania, M.N. College, Visnagar.
- R.S. Kaushal, Ramjas College, Delhi.
- Nagendra Kumar, K.G.K. (P.G.) College, Moradabad.
- Yogesh Kumar Mathur, University of Delhi.
- Kamal Kanti Nandi, North Bengal University, Darjeeling.
- Professor P.N. Pandita, North Eastern Hill University, Shillong.
- Dr. Harinder Pal Singh, University of Delhi.
- Dr. K. Yugindro Singh, Manipur University, Imphal.
- D.C. Srivastava, D.D.U. Gorakhpur University.
- Pradeep Kumar Srivastava, D.A.V. (P.G.) College, Kanpur.
- Anisul Ain Usmani, Aligarh Muslim University.

New Visiting Associates:

- Pavan Chakraborty, Assam University, Silchar.
- Ranabir Dutt, Visva Bharati University, Santiniketan.
- S.S.R. Inbanathan, The American College, Madurai.
- Sanjay Jain, Guru Premsukh Memorial College of Engineering, Delhi.
- U.S. Pandey, D.D.U. Gorakhpur University.
- M.K. Patil, Swami Ramanand Teerth Marathwada University, Nanded.
- Ramesh Babu T., Cochin University of Science and Technology, Kochi.
- Ramakrishna Reddy, Sri Krishnadevaraya University, Anantapur.
- J.P. Vishwakarma, D.D.U. Gorakhpur University.

Welcome to...

Vivek Kumar Agrawal, who has joined as a Post-doctoral Fellow. His research interests are Accretion and Emission Mechanisms in Compact Objects, X-ray Binaries, AGNs, and Ultraluminous X-ray Sources.

Rita Sinha, who has joined as a Project Scientist. Her research interests are Cosmic Microwave Background Anisotropies, Theoretical Nuclear Physics and Nuclear Astrophysics.

Himan Mukhopadhyay, **Sudipta Sarkar**, **Mudit Kumar Srivastava**, and **Sharanya Sur**, who have joined as Research Scholars.

... Farewell to

Jatush V. Sheth, who has joined the Max Planck Institute for Astrophysics, Garching, Germany, as a Post-doctoral Fellow.

IUCAA Post-Doctoral Positions

Applications are invited for post-doctoral fellowships at IUCAA, for durations which are flexible within a range of one to five years. The fellowship includes a remuneration, contingency grant, accommodation on the campus and medical benefits. Facilities required for research are provided through the general IUCAA budget. Post-doctoral fellows with excellent performance can be considered for a tenured position. The Inter-University Centre for Astronomy and Astrophysics (IUCAA) is an autonomous institution under the University Grants Commission. It was set up in December 1988 amidst the picturesque surroundings of the University of Pune. IUCAA has an integrated campus which includes the academic facilities as well as residential and recreational areas. IUCAA is a centre of excellence within the university sector for teaching, research and development in astronomy and astrophysics. The centre at present consists of about 35 academic members, including core faculty, post-doctoral fellows and graduate students, with potential for growth in the numbers. IUCAA has a vigorous visitor programme, involving short and long term visits of scientists from India and abroad. The centre has about 90 visiting associates from universities and colleges, who visit periodically and participate in all its activities. Further information can be obtained from the IUCAA website at www.iucaa.ernet.in.

Applicants should send a curriculum vitae and list of publications, and arrange for three confidential references to be sent independently. All the relevant material should reach IUCAA by November 25, 2004. Candidates will be informed of the result by January 15, 2005. Successful candidates are normally expected to commence their fellowship during 2005.

Facilities at IUCAA include a network of state-of-the-art computers, high speed internet connections, mirror sites of important databases like ADS and VIZIER, a very well equipped instrumentation laboratory and a library with exhaustive collections of books and periodicals. A 2m optical telescope is being set up by IUCAA at a site which is about 100 kms from the IUCAA campus and will be operational in 2005.

Research Areas covered by faculty members at IUCAA include:

- Classical and quantum gravity
- Cosmology and large scale structure
- Cosmic magnetic fields
- Gravitational waves
- Galactic and extragalactic astronomy
- High energy astrophysics
- Instrumentation for astronomy
- Interstellar medium
- Radio astronomy
- Solar system and stellar physics
- Virtual observatory

IUCAA has a vigorous observational programme in several areas. Support is available for guest observing from international facilities.

Other academic activities include a graduate school for Ph.D. students, teaching at the Master's level for students from the University of Pune and other universities, schools and workshops, refresher courses for university and college teachers, and a vigorous public outreach programme.

Applications and enquiries should be sent by post or e-mail to:
The Coordinator,
Core Programmes,
IUCAA, Post Bag 4,
Ganeshkhind,
Pune 411 007,
India.
Email: vch@iucaa.ernet.in

Congratulations

... to **Ujjaini Alam** on receiving the *Hartle Award* for the best student paper presentation in the GR-17 Conference held at Dublin, South Africa, in July 2004.

For The Younger Minds – 10

T. Padmanabhan

As kids, most of us would have played around with a magnifying glass and burned holes through scrap paper by focussing sunlight on the paper. Estimate the temperature at the focus of a hand held magnifying glass when it focusses sunlight.

Solution to *For The Younger Minds – 9*

Let the vertical direction be the y-axis and the horizontal direction along which the water sloshes be x-axis. The lowest mode is the one in which the height of the water goes up and down symmetrically about the middle, with the surface of water always remaining a plane. Suppose, at some moment of time, the displacement of the water along the edges is $\pm s$ about the equilibrium height h. Let the base length of the pan along the x-axis be $2R$. If the position of the centre of gravity(CG) of the liquid is now (x, y), then simple geometry gives: $x - R = (R/h)s$; $y - h/2 = s^2/6h$. Since the equilibrium position of the CG is $(R, h/2)$, it follows that the diplacements in the CG satisfies the relation $\Delta y = (1/2)(3h/R^2)(\Delta x)^2$. Assuming all the mass is at the CG, this gives a shift in the gravitational potential energy $\Delta U = mg\Delta y = (m/2)\omega^2(\Delta x)^2$ where $\omega = (3gh/R^2)^{1/2}$ is the frequency of sloshing mode. For $h \approx R \approx 10\ cm$, we have $\omega \approx 17$ Hz.

Visitors during July to September 2004

M. Sami, R. Chhetri, Bhim Prasad Sarmah, Indranil Chattopadhyay, L. Chaware, P. Hasan, M.K. Patil, R.U. Purohit, H.C. Patel, D.H. Trivedi, Ninan Sajeeth Philip, Arnab Rai Choudhuri, G. Rajasekharan, L. Chaturvedi, P. Agarwal, P. Prakash, N. Mukunda, A. Nigavekar, N. Saha, A.K. Gupta, Somak Raychaudhury, S. Barway, P. Trivedi, Arnab Ray, L. Sriramkumar, S.R. Kulkarni, Y. Akrami, E. Kourkchi, A. Pradhan, B. Ahmedov, V. Kagramanova, P. Janardhan, C.S. Stalin, Lau Li So, Irom Meitei, D. Deka, B.S. Sathyaprakash, V. Vinu, K. Srivastava, K.Y. Shaju, S. Sahayanathan, V.S. Shaju, K.S. Sumesh, G.C. Anupama, R. Ramachandran, Vijay Mohan, S.M. Chitre, Alak Ray, Ashis Nandy, Suresh Chandra, Aliakbar Dariush, K. Narayan, A. Zdziarski.

About 110 people from India and abroad attended the IVOA meeting during September 27 to October 1, 2004.

Visitors Expected

October

Z. Turakulov, Institute of Nuclear Physics, Tashkent; P.K. Srivastava, D.A.V.(PG) College, Kanpur; S. Karmakar, North Bengal University, Darjeeling; A.A. Usmani, Aligarh Muslim University; K.P. Harikrishnan, The Cochin College, Kochi; K.S.V.S. Narasimhan, Chennai; S. Ray, Barasat Government College, W. Bengal; S. Mukherjee, North Bengal University, Siliguri; B.C. Paul, North Bengal University, Siliguri; A. Pradhan, Hindu Degree College, Zamania; Vijay Mohan, ARIES, Nainital.

November

D.B. Vaidya, Gujarat; K. Jotania, M.N. College, Visnagar; T. Theuns, University of Durham, UK.

December

Babu Joseph, Rajagiri School of Engineering & Technology, Kochi; Somak Raychaudhury, University of Birmingham, UK.

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

We welcome your responses at the following address:

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