

5th IUCAA Foundation Day Lecture

Spirit and Freedom of Science Threatened

Vandana Shiva, noted environmentalist and humanist, delivered the 5th IUCAA Foundation Day Lecture on December 29, 1993 at 4.00 p.m. on "Protecting the Freedom of Science: The Challenge of the Late 20th Century". She is this year's recipient of the Right Livelihood Award (an alternate Nobel Prize) and is the Director of the Research Foundation for Science, Technology and Natural Resource Policies at Dehradun.

She propounded a view that the communities have evolved over the years traditional technologies embodied in their cultures. The Intellectual Property Right (IPR) for such technologies should entirely rest with the communities who evolved them rather than one person claiming a patent for this. Patenting them would amount to theft, leading to a world order based on theft.

The new world order, as expressed in the GATT proposal, according to Vandana Shiva, will rob

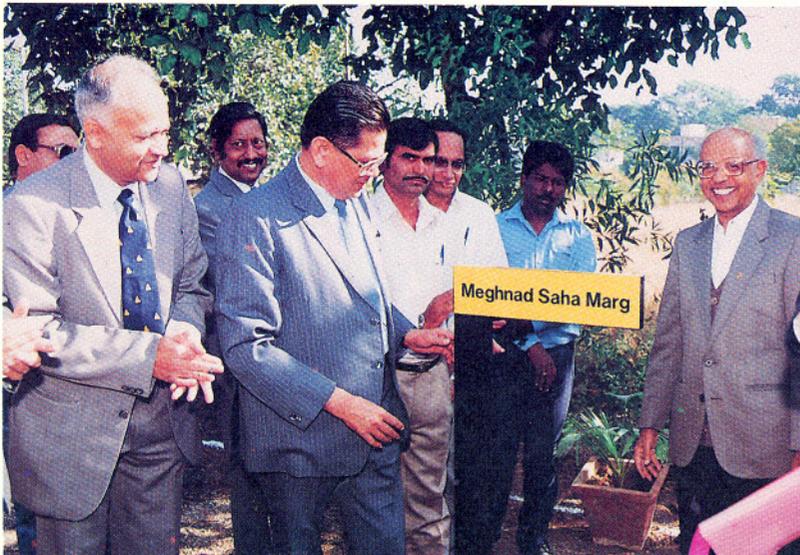
science of its very spirit of free and frank exchange of ideas. IPR provisions of the proposal have lead over jealous people to ridiculous patent claims for the Peruvian blue coloured cotton and the Neem toothpaste. The situation may emerge, that will require a scientist to consult his lawyer before discussing his results at scientific meetings for, one has first to safeguard one's patent claims.

Apart from the issues of justice and society, the new IPR provisions will take away the life from doing science and has constrained the exchange of ideas and thus cannot be conducive to creativity. She appealed to the scientists to be vigilant and take appropriate steps for promoting the spirit and freedom of science.

Campus Roads Named

In a simple ceremony on the site, Shreedhar Gupte, Vice Chancellor, Poona University, named the two roads bordering the IUCAA and NCRA campuses after two distinguished Indian astrophysicists.

Thus, the road between IUCAA and NCRA has been named after Meghnad Saha while that between the Akashganga and Devayani complexes of IUCAA is named after Vainu Bappu. By a happy coincidence, on the day of this ceremony, December 23, 1993, the Government of India released a special stamp and first day cover to celebrate the birth centenary of Saha.



Shreedhar Gupte naming the Road



Some of the Participants of Indo-US Workshop

Indo - US Workshop on AGN and Quasars

A Workshop on Active Galactic Nuclei and Quasars was held at IUCAA from December 06 to 17, 1993. This was the first in a series of the Indo-US Workshops to be hosted at IUCAA as a programme of Indo-US co-operation in astronomy and astrophysics. Funds for the workshop were provided by the Smithsonian Institution, USA. The workshop had lectures by: Ski Antonucci (Univ. of California, Santa Barbara), Martin Elvis (Centre for Astrophysics), Gary Ferland (Univ. of Kentucky), Pranob Ghosh (TIFR), Prabhakar

Parsecstones in Astronomy - 5

J. V. Narlikar

The "How" and "Why" of Planetary Motion

In the first half of the seventeenth century, the heliocentric theory was considered heretical. In 1633, its strongest defender Galileo Galilei had to face the inquisition and recant. However, within a few decades the theory not only got accepted but also received a firm physical foundation. Apart from Galileo, the credit goes to two persons: Johannes Kepler and Issac Newton.

Kepler started as an assistant to the famous astronomer Tycho Brahe from Uraniborg, Denmark. Tycho did not believe in the Copernican heliocentric theory and had collected a lot of observational data on planetary positions from his well equipped observatory in the hope of disproving the theory and proving his own version of the geocentric theory. However, he died in 1601 without realizing his dream. On his deathbed he enjoined Kepler to complete the mission with the help of data already collected.

With painstaking efforts lasting nearly two decades, Kepler completed his work only to find that the data corroborated the heliocentric view, but in a way not imagined even by Copernicus. For, till Kepler announced his results, circular trajectories known as epicycles, had played the key role in describing the planetary orbits (see Parsecstones in Astronomy - 4, Khagol, No.16). Kepler found that the typical planetary orbit is an ellipse with the Sun as one of its two foci. Kepler not only gave the shape of the orbit but also described the mathematical pattern behind the way planets move along their respective orbits with the Sun as the focal point.

This information is contained in Kepler's three laws of planetary motion announced in 1619 in his book, "De Harmonia Mundi" (The harmony of

the world). It is ironic, however, that although they were both on the continent, not very far from each other and were contemporaries, Kepler and Galileo did not meet or exchange ideas. For, both in their own ways were working towards the same goal: the understanding of the pattern of planetary motion.

In the end, it was left to Issac Newton in England separated from either of them by a greater distance in space and time to complete the picture. Newton was born in 1642, the year that Galileo had died. Taking off from Galileo's ideas on motion and inertia, Newton formulated his laws of motion. Given Kepler's laws as empirical facts, Newton was able to explain them within his dynamical framework and in this process made his great discovery of the law of universal gravitation.

For, Newton's laws of motion related the acceleration of a body to the force acting on it. From Kepler's laws, it was possible for Newton to find the planetary acceleration and hence the force acting on the planet. This is how he arrived at the inverse square law of gravitation.

With his characteristic genius, Newton used his newly discovered methods of calculus to work out the inverse problem, viz, what is the orbit if the force is given as per the inverse square law? The answer came out to be the orbits found by Kepler.

The publication of *Philosophiae Naturalis Principia Mathematica* (The Mathematical Principles of Natural Philosophy) in 1687 by Newton represents the culmination of human efforts over recorded history to understand how and why the planets move across the sky.

Gondhalekar (Rutherford Appleton Laboratory), Vijay Kapahi (NCRA), Ajit Kembhavi (IUCAA), Matthew Malkan (Univ. of California, Santa Cruz), and Patrick McCarthy (Carnegie Observatory). The topics covered included : continuum emission and absorption lines from quasars and AGN, X- ray UV and IR properties, radio emission from quasars, modelling of the emission lines regions, accretion disks and high redshift radio galaxies and luminosity functions. The speakers presented a summary of the field being covered by them as well as the latest work and ideas in it.

There were about 40 participants, in addition to the speakers, from various institutions, university departments and colleges in the country. Some of the participants presented seminars on their research work. There was a great deal of discussion during and after the lectures, and plans for future collaborations were made.

A 2-day trip to Mahabaleshwar was arranged as a part of the workshop, and some of the seminars were conducted in the salubrious surroundings of the Mahabaleshwar Club.

Making Your Own Planetarium

IUCAA had organised a national workshop on Making Your Own Planetarium during November 1 - 6, 1993, held in its premises. Each of the 24 participants, mostly teachers from schools, colleges and universities and some amateur astronomers, made a sky projector, using a plastic glow ball and flash light bulb arrangement. Even though it was a laborious job, practically everyone enjoyed finishing the project. On the last day, they also observed the transit of Mercury. Some of the participants also gave lectures and demonstrations. In particular, Bharat Trivedi from Baroda, made one star clock for finding sidereal time as a project work, which was also constructed by every participant (see page 5). The workshop demonstrations were assisted by Madhushri Barve, Madhavi Dinakaran, Sreekumar Menon, Banashree Mitra, K. Rajeev and A.N. Ramaprakash. [During December 24 - 28, 1993, The Rural Centre for Educational Studies and Develop

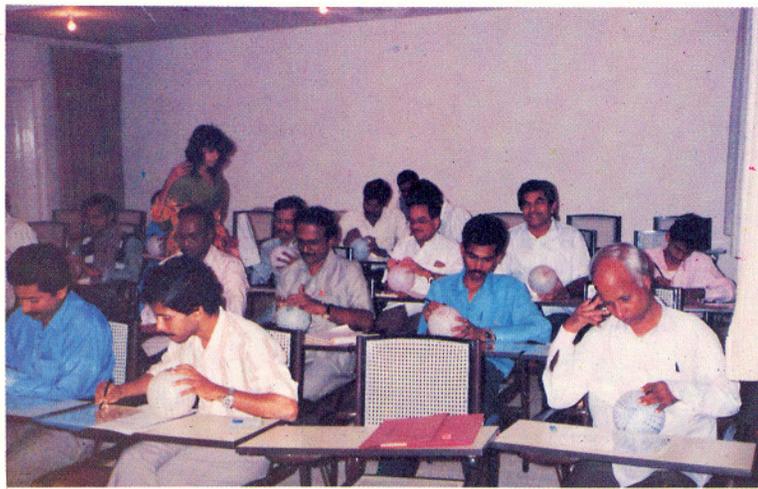
Formation of 'Confederation of Indian Amateur Astronomers'

National Organizing Committee of All India Amateur Astronomers' Meet, in a meeting of the committee, attended by 15 members and held at IUCAA during August 28 - 29, 1993, decided to form a confederation of Indian Amateur Astronomers. It was agreed that D.K. Soman will be its President and Pune the head quarters, with four other regional centres to start with. The memorandum of association along with its constitution was formulated and is ready for submission for formal registration. Anyone requiring further information may please contact its General Secretary, Mrs. K.V. Barve, Indraprastha, 755/1 Mayur Colony, Kothrud, Pune 411 029, India.

3" Telescope at JES College , Jalna

A 3" telescope was obtained on loan from IUCAA by the Physics Department of J.E.S. College, Jalna, in July 1992. The telescope was used during the Regional School on Introductory Astronomy organized at the college in September 1992. The limb darkening effect of the Sun and Sunspots were demonstrated. Teachers and college and school students of more than ten institutions were using this telescope for sky watching and popularization of Astronomy.

ment Programmes, Sanjeevan Vidyalaya, Panchgani, Maharashtra, conducted a similar workshop on a similar scale taking help of the expertise from IUCAA.]



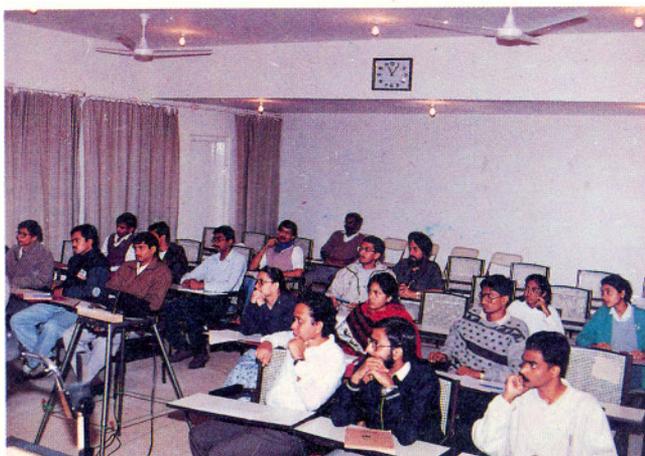
Participants engrossed in making the Sky Projector

Introductory School on Astronomy and Astrophysics for IIT Students

An Introductory School on Astronomy and Astrophysics for IIT students was held at IUCAA during December 6 - 18, 1993. Fourteen students from all the IITs in India participated. There were about 20 formal lectures, a mini-project work and a visit to the construction site of the GMRT as a part of the school activity. In addition, there were several informal discussion sessions in which the students participated enthusiastically. All the students felt that this kind of introduction to Astronomy and Astrophysics was extremely useful and stimulating. It is planned to continue this as a regular academic activity of IUCAA in future.

Congratulations !

To T. Padmanabhan on being elected the Fellow of The National Academy of Sciences, India.



A lecture session in the IIT School

Workshop on Astronomy Curriculum in Schools

As announced earlier, this workshop will be held during April 4 - 8, 1994. Number of participants will be restricted to 30 and preference will be given to secondary school science teachers. It would be extremely helpful if the exact astronomy curricula in the secondary schools of different states can be made available to us. **February 15, 1994** is the last date for receiving applications, in plain paper, giving bio-data and special interests, by the **Coordinator, Core Programmes, IUCAA.**

IUCAA - NCRA

INTRODUCTORY SUMMER SCHOOL ON ASTRONOMY AND ASTROPHYSICS

(May 23 - June 13, 1994, at PUNE)

The School is designed to introduce the students of Physics, Mathematics, Electronics Engineering and Technology to the exciting fields of Astronomy and Astrophysics (A & A). No previous knowledge of A & A is necessary, although familiarity with the basic principles of mathematics and physics will be required.

The school is funded by the Department of Science & Technology, New Delhi, and hosted by Inter-University Centre for Astronomy and Astrophysics and National Centre for Radio Astrophysics, Tata Institute of Fundamental Research, Pune.

The Programme of the school will consist of lectures covering fundamentals of A & A as well as recent developments in the field. In addition, participants will take part in individual projects under suitable guidance. The lecturers for the school will be drawn from the leading A & A centres in the country so that the participants will get an exposure to the work being done in these fields

nationally. There is a possibility for a few motivated students, to spend an additional week at IUCAA/NCRA after the school.

Eligibility: Students completing their 1st year M.Sc. (Physics/Mathematics) or 3rd year B.E./B.Tech. in 1994. Exceptionally bright and motivated students completing their B.Sc. (Physics) in 1994 may also apply.

How to apply : In plain paper in the following format: 1. Name, 2. Sex, 3. Date of Birth, 4. Address for Communication, 5. Qualifications (standard X onwards) with institution /year/subjects /class /grade/percentage of marks obtained, 6. Short write up giving motivation for applying for the school, 7. Previous summer schools attended, if any, 8. Names and addresses of two referees, 9. Signature with date.

The applicants should request the above referees to send their confidential assessments / recommendations under separate envelopes. Applications and referee reports should reach the **Coordinator, Core Programmes, IUCAA,** by March 14, 1994. The selected candidates will be informed by March 28 and provided with travel and free boarding and lodging.

Here is a novel star clock for you. As the name suggests, using this clock you can tell time by looking at stars. Ancient navigators used to call it a 'Nocturnal'. During day, they used sundials and at night, the nocturnal to know the time. While you need different sundials for different latitudes, the nocturnal is universal.

The earth rotates on its axis once a day from west to east and as a result of which we see all stars and other objects in sky rising in the east and setting in the west. The earth also goes round the sun once a year. Together, these two motions of earth make stars to rise about 4 minutes early each day. This curious phenomena enable us to see different stars in different seasons and also to use the position of the stars to tell the time. Let us rediscover the way of reckoning time by stars.

In fact, we can tell time by looking at any star, but here, we shall tell time by looking at specific stars of two well known constellations, 'Saptarishi' (Ursa Major) and 'Sharmistha' (Cassiopeia), one of which is generally always up throughout the year.

Before we learn how to use the star clock, let us first construct one. As shown on the separate sheet (enclosed herewith), the clock has three main components, the handle, the dial and the pointer. In addition to these, a hollow rivet (about 12 mm O.D., 12 mm long) and two washers (30 mm O.D. x 12 mm I.D. x 2 mm thick) are also needed. A piece of PVC pipe could be used instead, and heated for flaring its ends.

Take a photocopy of the dial and paste it on to a stiff card. Cut central hole into dial of the size of the rivet. Similarly cut handle and the pointer from a 2 mm thick clear acrylic sheet (you may cut these from transparent plastic scales). Cut central holes in handle and pointer too. Using a scribe, mark deep centre lines on both and fill with any contrasting colour. Now you are ready to assemble the clock. Take the rivet and flare it at one end.

Visit Abroad

Tarun S. Ghosh visited the following institutes during Aug. - Oct. '93: Institute de Astrophysique, Paris; Univ. of Pennsylvania; Bartol Research Institute; C.I.T.A, Toronto; Fermilab Theoretical Astrophysics; University of Wisconsin, Milwaukee; CFPA, UC Berkeley; SCIPP, UC Santa Cruz; Caltech; YITP- University of Kyoto; CERN theory group; M.I.T.; Tufts Center for Cosmology; Stanford University and the Institute of Astronomy, Hawaii. He also attended the Les Houches Summer School (Aug. 2 - 27) and the symposium of Relativistic Cosmology at Nishinomiya, Japan (Oct. 28-29).

Keeping the flared end of the rivet at bottom, assemble in order, washer, handle, dial, pointer and finally a washer. Flare the upper end of the rivet such that while there is no axial play, the individual components are free to rotate about the rivet. The clock is now ready for use.

Let us see how we reckon time with the new star clock. Go out in the open and look up to the sky. One of the constellations, either 'Saptarishi' or the 'Sharmistha' will be up in the sky. Also you can easily locate the pole star. It is situated almost north at an altitude equal to your latitude. Now align the date with centre line on the handle. The date lines are marked on the dial at 5 days interval and you can easily interpolate intermediate dates with little practice. Holding the dial in position with little thumb pressure, keep the clock about 12 inches away from your eye such that the plane of the dial is orthogonal to the direction of the pole star, and the pole star is seen in the centre of the rivet. Now without moving the clock, rotate the pointer till its edge aligns with either α UMa (α Ursa Majoris star in Saptarishi) or β Cas (β Cassiopeia star in Sharmistha). Now read the time along centre line of the pointer on the time circle of the dial. Use outer time circle if you have aligned the α UMa star or use inner time circle if you have aligned the β Cas star. The time circles are marked in full hours as well as 20 min. intervals. Here also you can easily interpolate upto 5 minutes with little practice.

The time you read on your star clock is your local time. If you wish to convert it into Indian Standard Time (IST) then you have to apply a simple longitude correction. The longitude correction in minutes of time = $(82^{0.5} - \text{Longitude degrees}) \times 4$. Add the correction (with proper sign) to the local time you read on the star clock to get IST.

It will be a great fun to have your star clock on your next hiking trip, or perhaps you may like to make one for your next science exhibition at the school. Anyway you like it, if you have the inclination then stars have a lot of time for you.

Errata

Astroproject - 1 in Khagol, No. 13.

The last paragraph should be corrected as follows: "[82.5 - Longitude (east)] x 15 minutes" should be changed to "[82^{0.5} - Longitude (east)] x 4 minutes."

Astroproject - 4 in Khagol, No. 16.

The last paragraph should read as follows: "The distance to Moon can now be estimated by dividing the baseline...value of the parallax."

Coloquia held during October - December 1993.

27.10.93 J.G. Negi on *South Indian Earthquakes*, 17.11.93 Antony Hewish on *Imaging Interplanetary Weather Patterns*, 21.12.93 V. Krishnamurthy on *Counting Techniques of Polya*.

National Science Day

This annual event is as usual scheduled for the morning hours of Monday, February 28, 1994. This time with our added Auditorium facility, we can easily accommodate participation from about 80 schools, no longer necessarily to be restricted to the city of Pune only. Four students (IX to XII standard) forming a team from each school and a science teacher can register for participation endorsed by the head of the school. Programmes generally include short lectures, quiz contests, small experiments and demonstrations and observation through telescope. IUCAA's rolling Trophy and Cup for the winning teams have become quite popular among the participants. General public will be allowed to visit IUCAA in the afternoon.

RESEARCH SCHOLARS 1994

IUCAA invites applications for its graduate school leading to a Ph.D. degree in Astronomy and Astrophysics. Selection for the academic year 1994-95 will be made on the basis of a written test and interviews to be held in Pune sometime early July 1994. The academic programme will commence in August 1994.

Graduate school: Selected students will undergo graduate courses in physics, astronomy and related areas for two semesters. Satisfactory completion of the courses will allow students to register for a Ph.D. programme. The graduate courses will be organised in collaboration with the National Centre for Radio Astrophysics (NCRA) of the Tata Institute of Fundamental Research (TIFR), Pune Campus. The total duration of the Ph.D. Programme, including the graduate school, will be 4 years.

Qualification : Students with M.Sc. in physics / applied mathematics / astronomy / computer science or Bachelor's or Master's degree in engineering or technology with adequate background in physics and mathematics are eligible to apply. Candidates with an engineering or technology background and interest in experimental physics are also encouraged to apply. Candidates



Honorary Fellow Antony Hewish in IUCAA

The Fourth All India Amateur Astronomers' Meet

This Meet is scheduled to be held in Calcutta during January 21 - 22, 1994. About 100 amateurs from all over the country have sent in their participation registrations as informed by its convener Asis Mukherjee. Presidency College, Calcutta, has agreed to provide a venue for it, and a week long astronomy fan fair with exhibitions, lecture sessions, etc. have been scheduled.

expecting to obtain their degrees by July 1994 may also apply. All selected candidates will be required to clear the UGC/CSIR NET or GATE examination within one year of admission to the research programme, if they have not already done so.

Scholarship : Each student will be paid a scholarship of Rs. 1,800 p.m. for the first two years and Rs. 2,100 p.m. for the remaining two years (It is likely that these amounts will be raised shortly). In addition, there will be a contingency grant of Rs. 7,500 p.a. and other benefits including free accommodation. The continuation in the scholarship is, however, subject to satisfactory performance of the student every year.

Application : Forms can be obtained by writing to the **Coordinator, Core Programmes, IUCAA**, alongwith 24 x 11 cm self addressed stamped (Rs. 2.00) envelope. Completed applications should arrive at IUCAA no later than April 1, 1994. Candidates called for written test and interviews will be paid 1.33 times the rail fare each way by II class (not air-conditioned) and a halting allowance for the days of the interview. A common test and interviews may be conducted for admission to IUCAA and NCRA (TIFR).

VACATION STUDENTS PROGRAMME 1994

IUCAA invites applications for the fourth Vacation Students Programme (VSP). Students selected under the VSP will spend six weeks at IUCAA to work on specific research projects under the supervision of the IUCAA faculty. The programme will conclude with seminar presentations of the projects by the participants, a written test and an interview. Those who perform well will be preselected to join IUCAA as research scholars after the completion of their degree.

Students who will enter the final year of the M.Sc. (Astronomy, Mathematics, Physics) / B.Tech/B.E. courses in the academic year 1994-95 are eligible to apply. Application in plain paper, giving the academic record of the applicant as well as two letters of recommendations from teachers, mailed directly, should reach the **Coordinator, Core Programmes, IUCAA**, by March 1, 1994. The selected candidates will be informed by April 1, 1994 for the programme to be held during June 1 - July 15, 1994.

IUCAA Preprints

IUCAA preprints released during October to December 1993 are listed below. These can be obtained from the **Librarian, IUCAA**.

Chervon S.V. *Non-linear Sigma Models for Inflation Scenarios II*, IUCAA-26/93; Gulati R.K., Gupta Ranjan and Gothoskar Pradeep *Stellar Spectral Classification using Automated Schemes*, IUCAA-30/1993; Hoyle F., Burbidge G. and Narlikar J.V. *Astrophysical Deductions from the Quasi Steady-State Cosmology*, IUCAA-32/93; Jotania Kanti, Dhurandhar Sanjeev and Valluri S.R. *Signal Analysis of the Gravitational Waveform of Pulsars*, IUCAA-24/93; Masafumi Seriu *On the Smallness of the Cosmological Constant*, IUCAA-29/93; Munshi Dipak and Starobinsky A.A. *Non-linear Approximations to Gravitational Instability: A Comparison in Second-Order Perturbation Theory*, IUCAA-31/93; Padmanabhan T. *Cosmology Today - Models and Constraints*, IUCAA-27/93; Sahni Varun, Sathyaprakash B.S. and Shandarin S.F. *Evolution of Voids in the Adhesion Approximation*, IUCAA-28/93 and Valluri Monica *A Model for the Declining Rotation Curves of Cluster Spirals*, IUCAA-25/93.

Seminars held during October - December 1993.

8.10.93 Poorvi Vora on *Set Theoretic Constrained Reconstruction*, 14.10.93 J. Batt on *The Initial Value Problem of Stellar Dynamics* and 15.10.93 on (Linear) *Stability of Stationary Models of Stellar Dynamics and Plasma Physics*, 20.10.93 Biplab Bhawal on *Nobel Prize 1993: Hulse - Taylor Binary Pulsar*, 21.10.93 Masafumi Seriu on *On the Smallness of the Cosmological Constant*, 28.10.93 B.S. Sathyaprakash on *Gravitational Wave Tails and Their Detection*, 18.11.93 J. Maharana on *Non-compact Symmetries in String Theory*, 1.12.93 (video seminar) Sir Fred Hoyle on *Microwave Background and the Quasi Steady State Cosmology*, 3.12.93 Dipak Munshi on *Non-linear Approximations to Gravitational Instability: A Comparison in Weakly Non-Linear Regime*, 10.12.93 R. Bhatia on *Current Trends in Astronomical Telescopes and Instruments* and 30.12.93 and 31.12.93 Daksh Lohiya on *Gravity Balls*.

Young Astronomers' Meet 1994

Young Astronomers' Meet (YAM) was initiated by students of IUCAA and NCRA in the year 1992. It was envisaged as a forum in which students from various institutes and universities can present their work. The first and the second meetings were held at Pune (1992) and Bangalore (1993) respectively.

YAM is a meeting of students working in Astronomy, Astrophysics and interface areas like Gravitation and Astroparticle Physics. The main aim of YAM is to develop interaction between students working in these areas. The meet is open to students working in above mentioned areas and also to those who have completed their Ph.Ds. recently.

The third YAM will be held at IUCAA in August 1994. For more details please contact **Young Astronomers' Meet, IUCAA** or yam@iucaa.ernet.in.

Welcome...

to Sucheta Koshti, who has joined as post-doctoral fellow of NBHM and Ramen Kumar Parui, who has joined as project scientist.

There will be a workshop on "Two Years After COBE" during April 25 - 28, 1994 at IUCAA. The workshop will bring together about 20 people from India and abroad to discuss various aspects of cosmology and structure formation related to the COBE discovery of Anisotropy in the microwave background. There will be pedagogical lectures, covering various aspects of cosmology and structure formation related to COBE as well as a few seminars on selected topics. The participation is by invitation and limited travel support may be available. Those who are interested in participating should write to **The Coordinator, Core Programmes, IUCAA, by February 10, 1994.**

Visitors expected during January-February 1994

January: P. Coles, Queen Mary & Westfield College; P. Eggleton, Institute of Astronomy; S. Isobe, Univ. of Tokyo ; J.P. Ostriker, Princeton Univ. ; D. Wentzel, Univ. of Maryland. **February:** Nils Anderson, Univ. of Wales College of Cardiff; Pijush Bhat-tacharyya, IIA; N.T. Bishop, Univ. of South Africa; D.G. Blair, Univ. of Western Australia; L. Brink, Sweden; S.M. Chitre, TIFR; G.F.R. Ellis, Univ. of Cape Town; M. Gerbaldi, Institut d'Astrophysique, ; Rohini Godbole, Bombay Univ.; F. Hoyle, UK (*Hon. Fellow of IUCAA*); Pankaj Joshi, TIFR; Kamlesh Kar, Saha Institute of Nuclear Physics; S. Maharaj, Univ. of Natal; T.K. Menon, Univ. of British Columbia; Leon Mestel, Univ. of Sussex; S. Mukherjee, North Bengal Univ.; N. Panchapakesan, Delhi Univ.; K.V.L. Sarma, TIFR; S.K. Srivastava, North Eastern Hill Univ.; R.S. Tikekar, Sardar Patel Univ.; C.S. Unnikrishnan, TIFR; and C.V. Vishveshwara, IIA.

They Beat us !

The target of 91 in 20 overs set by the IUCAA batsmen was a respectable one, but their NCRA counterparts passed it with ten balls to spare. With the exception of a few brilliant catches that any professional would be proud of, our fielding was not worth writing home about. It reached its nadir when the ball from an overthrow slipped through the hands and feet of four IUCAA fieldsmen and tired of the chase came to rest on its own; in the meanwhile the NCRA batsmen ran four. The Foundation Day cricket match has been won by IUCAA in 1989 and 1992 while our rivals have been successful in winning the "astronomical ashes" in 1990, 1991 and 1993.

October: K.R. Anantharamaiah, P.C. Agrawal, B. Bala, A.C. Balachandra Swamy, J. Batt, K. Boruah, B. Ishwar, Sai Iyer, U.C. Joshi, J. Perry, L. Radhakrishna, K.P. Singh, and S.G. Tagare. **November:** M.N. Anandaram, A. Hewish, M.E. James, B.A. Kagali, M.L. Kurtadikar, S. Maharana, A. Omont, L.K. Patel, S.K. Popalghat, Vivekananda Rao, Somasunder, D.B. Vaidya and S.D. Verma. **December:** F. Ahmed, R. Bhatia, J.N. Desai, H.L. Duorah, K. Kasturirangan, Pramod Kumar, P.K. Maity, H.S. Mani, G.K. Mehta, P.S. Naik, R. Nityananda, B.K. Pal, A.K. Pandey, S. Sudershan Rao, R.R. Rausaria, P. Jayaram Reddy, M.I. Savadatti, J.K. Sharma, J. Singh, K. Sinha, K.R. Sivaraman, R. Srinivasan, R. Tikekar, and V.K. Verma.

Good Heavens!

Here is a story we heard about what happened when the ubiquitous e-mail network finally linked the heaven to the earth.

The recently departed physicist X was assigned the following e-mail address on his arrival in paradise: **X@eden.heavenet.par.**

And shortly thereafter he received a message from his friend Y still down on the earth, enquiring how things were up there. He sent the following reply back to Y:

"I have good news and bad news for you. Good news is that theoretical physics is doing very well here. There is no funding problem, and no shortage of brainpower. We have regular discussions and seminars where Newton, Maxwell, Einstein, Schrodinger, Heisenberg, Dirac, Feynman and so many others participate. They have still not found the Theory of Everything. So physics is not at an end contrary to what some of them tell you on the earth."

"Relieved to know that!" replied Y. "Now, tell me the bad news."

There was a pause before X replied: "They have arranged a seminar by you next week."

Khagol (the Celestial Sphere) is the Quarterly Bulletin of IUCAA. We welcome your responses at the following address:

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