

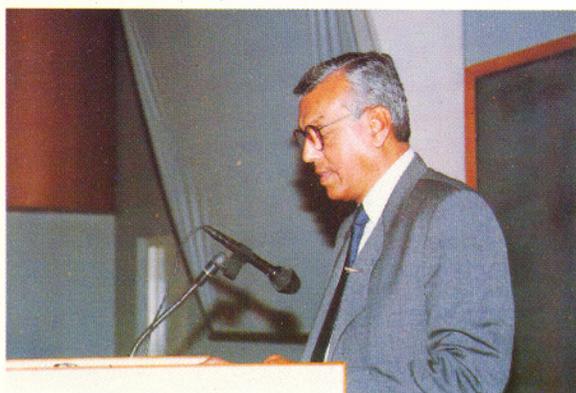
## *IUCAA Foundation Day*

The highlight of our Foundation Day, December 29, 1994 was, of course, the Lecture by Ashok Ganguly, Director, Unilever, London. With the tantalizing title, "Who should look at the stars?" of the lecture dealt with issues very relevant to IUCAA. Should a poor country like India devote scarce resources towards blue sky research like astronomy? Is frontier research in astronomy of any use to the common man? The speaker raised these oft-repeated questions and it cheered us no end when he came out with a resounding "Yes" for answers. With historical examples and contemporary issues ranging from Galileo to comet Shoemaker-Levy, he made out a strong case for that answer.

In the end, Ashok Ganguly cautioned against the disastrous consequences for India in a rapidly evolving world if the present policy of benign neglect of higher education as well as science

and technology is continued to be pursued. He stressed the need for clearing out or restructuring scientific institutions that have outlived their utility and creating fresh new ones in the future. His bottom line was: "Without overhauling our S & T base, India faces a finite economic horizon."

P.C. Vaidya had opened our Recreation Centre in the Aditi shed two years ago. It was a pleasure to have him around to name the new building for the Recreation Centre, which was just got ready on the Foundation Day. The name is appropriately, "Chittaranjan" (Recreation for the mind). The building, built next to the existing tennis courts in the Akashganga housing complex, has a lounge, a library, a covered badminton court, area for chess and cards, a table-tennis table and a gym. It will also have canteen facilities. We hope that our visitors will make full use of these facilities.



Ashok S. Ganguly delivering the 6th IUCAA Foundation Day Lecture



IUCAA Recreation Centre, "Chittaranjan", was opened by P.C. Vaidya, Honorary Fellow, IUCAA, on December 29, 1994

## Second Indo-US Workshop

The second Indo-US workshop on Array Detectors and Image Processing was held at IUCAA during November 28 - December 10, 1994. Out of a total of 39 participants, 7 were from USA. The topics included (i) technology of CCDs and near and mid-infrared arrays, (ii) controllers for these, (iii) optimisation of and noise reduction in controllers, (iv) instrumentation for astronomical photometry and spectroscopy and (v) reduction and analysis of photometric and spectroscopic data in astronomy. Through informal discussions, many details and ideas were communicated, which are not available in literature, and this exchange is expected to give a boost to the research efforts of the participants.



Participants of the Second Indo-US Workshop

### *Parsecstones in Astronomy - 9*

*J.V. Narlikar*

#### Stellar Studies in Bulk

The nineteenth century saw astronomers take on studies of stars in bulk. Of particular interest were the clusters of stars and the nebulae. With his large telescopes including the 48-inch reflector, William Herschel made pioneering discoveries which led to the first attempt at finding the structure of our Galaxy.

The key feature of this structure which is visible to the naked eye on a clear night is of course the Milky Way, a white band stretching across the sky. By counting stars in different directions, Herschel demonstrated that they are concentrated in the plane of the Milky Way. If we imagine ourselves as located in this plane then looking out, we would see the stars in the "disc" projected in a band. Today, we call this disc of stars the "Galaxy".

Herschel found the star clusters to be distributed mainly in the plane of the Milky Way; the nebulae, however, seemed to avoid that plane. Unlike the stars, the nebulae have a diffuse cloud-like appearance and Herschel thought them to be components of the Milky Way system. Some indeed seemed to have a central star.

Back in the eighteenth century, the mathematician J.H. Lambert had suggested that by and large the nebulae were large clusters of stars - they were galaxies like our Milky Way Galaxy, but because

they happened to be very far away they looked small and one could not make out their starry character. However, Herschel thought otherwise: because these nebulae avoided the plane of our Galaxy he felt that their distribution was somehow related to the structure of the Galaxy. Herschel's studies also led him to believe that our Sun and the Solar System were located very close to the centre of the Galaxy.

Eventually, these conclusions of Herschel proved to be wrong. The crucial aspect of the cosmos that he had not been aware of was the presence of dust. Like stars, clouds of dust particles are also concentrated in the disc of the Milky Way, thus obscuring the view of all distant objects lying in that plane. Which is why no nebulae are seen in the galactic plane. It was the dust obscuration that also misled Herschel about the true extent of our Galaxy and our location in it. But the real picture emerged only in the present century.

However, so far as bulk studies of stars are concerned, the most ambitious project was *Boner Durchmusterung*, a catalogue of over 300,000 stars published by Friedrich Argelander between 1852 and 1862. Modern catalogues are based on this mammoth work which is all the more remarkable because it was done without the use of photography.

## The Sixteenth Meeting of the ASI



The sixteenth meeting of the Astronomical Society of India was held at IUCAA during October 25-28, 1994. A total of 171 participants attended the meeting, of these 58 were from Pune; there were 40 participants from universities and other educational institutions.

The academic programme began with the address by S.M. Chitre, President of the Society, on *Probing the Solar Interior*. There were fifteen invited talks which covered a range of observational and theoretical topics.

There were two special sessions on *Comet Shoemaker Levy 9 and Jupiter Collision* and *Science with GMRT* and twelve oral presentations of contributed papers but most of the contributed papers were presented as posters. The ninety poster papers were summarised in seven

rapporteur talks on the following areas: *Sun and Solar System Astronomy, Stars and Stellar Astronomy, Galactic Astronomy, Galaxies and AGN, Cosmology and Early Universe, and High Energy Astrophysics and Pulsars*.

There were seven presentations of recent theses works, and of these, two were chosen as outstanding : (i) *Statistical Studies of the Redshifts of Spectral Lines of QSOs* by D. Duari, and (ii) *IPS Observations of Variability in the Solar Wind* by P. Gothoskar. They were given awards.

There was a visit to the GMRT site on October 27, 1994. The proceedings ended with the general body meeting of the Society which also gave its approval to the election of the next Executive Council with K. Kasturirangan as its President, and Vinod Krishan as the Editor of the Bulletin of ASI.

### *Inter-University Graduate School on Large Scale Structure in the Universe*

An Inter-University Graduate School on Large Scale Structure in the Universe, jointly sponsored by the UGC and IUCAA, was conducted in Mysore University during November 21 - December 10, 1994. The school offered refresher courses in General Relativity and Cosmology and also focussed on advanced topics in Cosmology such as: Astroparticle Physics: The Early Universe, Phase Transitions, Topological Defects, Inflation and Baryogenesis; Structure Formation in the Universe: Correlation Functions, Hot and Cold Dark Matter Models, The Press-Schechter Formalism, The Zeldovich Approximation and N-body Simulations; Cosmic Microwave Background; High Redshift Universe: QSO's, Radio Galaxies and the Inter-galactic Medium; Clusters of Galaxies; Gravitational Lensing by Clusters, etc.

Participants to the school included graduate students, post-docs and lecturers from different parts of the country. Also present were participants from Nepal, Jordan and Germany.

### *Preparatory Workshop on Total Solar Eclipse 1995*

A Preparatory Workshop on Total Solar Eclipse (October 24) 1995 was held at IUCAA during October 3-7, 1994. About forty participants, mostly amateur astronomers and college teachers attended it. Lectures and practical demonstrations with camera and telescope for shooting and safe viewing were arranged. About thirty amateur clubs participated in it. Due to the fear of the plague epidemic, some of the lecturers could not turn up, but many participants opted for discussions about their own programmes. It was felt that sometime during the next March or April, another preparatory workshop could be arranged for practically on-line demonstration and rehearsal of the individual teams' mission. The feedback from the amateur astronomers' community to this respect will be gathered from their fifth Annual Meet to be held at Bhubaneswar during January 14-16, 1995 and accordingly a decision will be made.

## MEASURING MAGNITUDES OF VARIABLE STARS

In Astroproject-8, we have seen how a star of known magnitude can be used for measuring the brightness of the sky. In this project we shall see how to measure magnitude of variable stars, stars whose magnitude changes at time scales of decades or less. Flux output (or magnitude) of all stars changes as they evolve, but such changes are over  $10^6 - 10^9$  years.

A cause for variation of magnitude could be external, such a star being occulted by its much cooler companion and we see drop in light. Such stars are extrinsic variable. Or some physical changes in the star might be taking place. Such variable stars are intrinsic variable. The knowledge of how a star's magnitude is changing can tell us a lot about its properties.

Star Algol in the constellation Perseus is the best known variable star of extrinsic type. Variation of its light is plotted against time in Figure 1. Such curves are called 'light curves' of the star. It can be seen from the graph that the magnitude of the star drops from 2.1 to 3.4. This takes about five hours and in the next five hours it regains its original magnitude.

The photometer built in the last project (without the 20 mm diameter lens) can be used for monitoring the magnitude of the star. The photometer should fit in the place of the eyepiece such that photodiode is at the focus of the telescope lens. We will, however, require a telescope with a large lens, such as a 3 inch telescope made by CSIO, to collect more flux. The steps involved in taking the observations are as follows:

1. Carefully polar align the telescope.
2. Note the battery voltage with full load connected - it should be more than 8 volts.
3. Take the dark reading  $R_0$  with photometer covered using its cap.
4. Centre star in the field of the eyepiece. Move the star to east by moving the telescope in right ascension. Allow the star to drift. It should pass through the centre of the field. If it does not, then redo the polar alignment.
5. Now move the star to east (that is, move the telescope to west) and replace the eyepiece by the

photometer. Take the voltage readings every 10 seconds.

6. Initially, light from sky alone falls on the detector. This reading corresponds to sky or background light  $R_B$  (see Figure 2a). The reading rises as star drifts across the surface of the photodiode. This reading is  $R_S$  (see Figure 2b). The readings will fall again as the image drifts outside the photodiode, giving  $R'_B$  another reading for the sky (see Figure 2c). Take three or four such observations.

7. In the end, take dark reading and check battery voltage. There should be no significant change between the readings taken now and earlier.

Mean voltage values of  $R_S - (R_B + R'_B)/2$  can be plotted against time to give us the light curve.

In order to get the magnitude of the star we will have to compare it with some other star which we know is a standard or non-varying star.

Algol can be compared with Mirphak or  $\alpha$  Persei, as shown in the map. Observing procedure will be the same as that for Algol.

If  $R_P = R_S - (R_B + R'_B)/2$  for Algol (or the programme star) and  $R_C = R_S - (R_B + R'_B)/2$  for Mirphak (or comparison star), the magnitudes of Algol and Mirphak are  $m_p$  and  $m_c$  respectively, then

$$m_p - m_c = -2.5 \log (R_P / R_C).$$

One must remember that some amount of light coming from a star is scattered and absorbed by dust and molecules in the atmosphere. The correction for this extinction is not large for zenith angles less than  $45^\circ$ , but for larger zenith angles of the stars, a correction should be applied for extinction - this would be discussed in a future Astroproject.

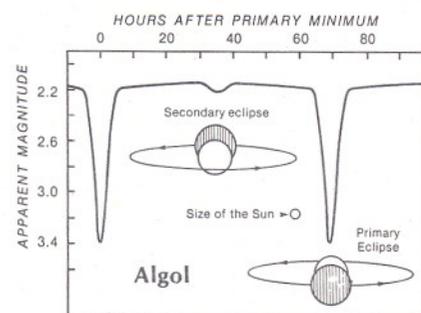


Fig. 1

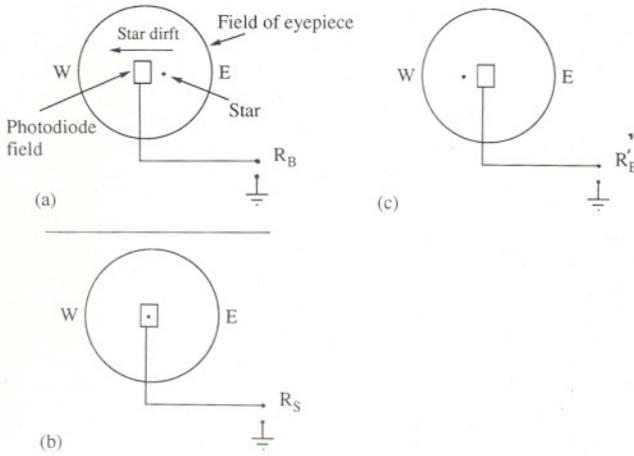
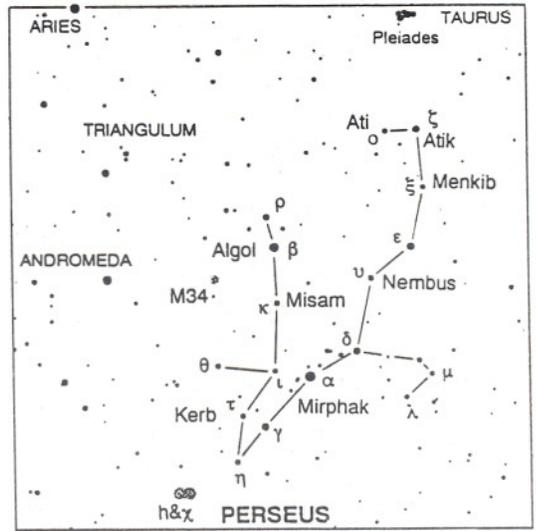


Fig. 2



### Seminars held during October - December

4.10.94 **R. Gupta** on *A new approach to stellar spectral classification*, 6.10.94 **P.R. Pisharoty** on *Magnetic phenomena during total solar eclipse*, 11.10.94 **S.V. Dhurandhar** on *Detecting gravitational waves from pulsars by resonant bar antennae*, 17.11.94 **J.V. Narlikar** on *New determinations of Hubble's constant*, 1.12.94 **S.S.De** on *Particle masses: entropy and particle production in the very early universe*, 13.12.94 **S. Sarkar** on *Weak interaction rates for presupernova stars*.

### Colloquia held at IUCAA...

5.12.94 **S.B. Ogale** on *Superconductivity and magnetism - A strange relationship!*, 12.12.94 **K.R. Parthasarathy** on *Brownian motion and some applications*, 26.12.94 **Kameshwar Wali** on *Non-commutative geometry: Is it the Riemannian geometry of particle physics?* and 28.12.94 **Abhay Ashtekar** on *Glimpses in quantum geometry*.

### Workshop on the Heritage of Ancient Indian Astronomy

A workshop on the Heritage of Ancient Indian Astronomy was held at IUCAA during October 31 - November 4, 1994. About 50 participants, mostly college and university teachers, amateur astronomers and learned scholars of history of astronomy, attended it. There were about 25 scholarly lectures delivered by the distinguished speakers. The proceedings of the same will be brought out as a special supplement to the Bulletin of the Astronomical Society of India.



Participants of the Workshop on the Heritage of Ancient Indian Astronomy

### Introductory School on Astronomy for IIT students

The Introductory School on Astronomy for IIT students was held at IUCAA during December 5-24, 1994. In the school, several lectures were arranged in various areas of astrophysics and astronomy providing basic exposure to the subject and to convey the excitement in the frontier areas. Eleven students from the IITs participated in the school. The students took projects with the faculty and gave presentations at the end of the school. In addition, the students were taught to handle an optical telescope at IUCAA to perform astronomical observations. A visit to the GMRT site was also arranged.

### National Science Day

The National Science Day will be celebrated on February 28, 1995 as usual with the primary focus on the forthcoming total solar eclipse of October 24, 1995.

## Regional Meeting for Universities of Eastern India

This meeting was sponsored by IUCAA and held at the Department of Mathematics, B.R. Ambedkar Bihar University, Muzaffarpur, during October 3-4, 1994. The main objective of the meeting was to promote research work in Astronomy and Astrophysics to University/College teachers and research workers in the region. Altogether 44 participants including Orissa(5), U.P.(4), Bihar (13), and 22 local teachers attended the meeting. J.V. Narlikar, Director, IUCAA, gave the key note address while Vice-Chancellor B.R.A. Bihar University presided over it. B. Ishwar, Coordinator, presented a brief report about the utility and different academic programmes of the meeting.

There were 10 lectures by invited resource persons from IUCAA, B.R.A. Bihar University, T.M. Bhagalpur University, Gorakhpur University and Utkal University. There was an open general discussion and J.V. Narlikar encouraged the participants to use the



Participants of the Regional Meeting for Universities of Eastern India

facilities at IUCAA, including the Library, Computer Centre, Data Centre, E-mail and interactions with faculty members. A visit to Vaishali, an ancient democratic state, was arranged for the participants.

J.V. Narlikar and S.N. Tandon were guests of the Governor of Bihar and had discussions with him at dinner on October 4, 1994. They also visited Nalanda and Rajgir on October 2, 1994.

### RESEARCH SCHOLARS 1995, Admission Notice

IUCAA invites applications for its graduate school leading to a Ph.D. degree in Astronomy and Astrophysics. Selection for the academic year 1995-96 will be made on the basis of a written test and interviews to be held in Pune in the first week of July 1995. The academic programme will commence in August 1995.

**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 expecting to obtain their degrees by July 1995 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. 2,500/- per month for the first two years and Rs. 2,800/- per month for the remaining two years. In addition, there will be a contingency grant of Rs. 10,000/- 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, 1995**. 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).

## Visits Abroad

**T. Padmanabhan** was a visiting faculty member at the Department of Astrophysical Sciences, University of Princeton, USA, during September 15 - November 30, 1994. He was collaborating with Jerry Ostriker on problems related to formation of large scale structures. He also visited the Department of Astrophysics, Pennsylvania State University and gave a colloquium on "Constraints on Cosmological Models". Padmanabhan was also a participant in the workshop on Cosmic Microwave Background Workshop, held on November 7, 1994, at the Institute for Advanced Study, Princeton.

**Varun Sahni** participated in the International Workshop on Large Scale Structure in the Universe -- Observational and Theoretical Aspects, which was held in Geltow Potsdam, Germany, during September 18-24, 1994. He delivered a talk on Voids and Their Evolution in the Adhesion Model at the workshop. Varun also visited the newly established Theoretical Astrophysics Center in Copenhagen where he spoke on The large scale structure of the Universe and Burger's equation.

**B.S. Sathyaprakash** attended the course on Current topics in astrophysical physics held at Erice, Italy, during September 4-16, 1994. He participated in the meeting on Large Scale Structure in the Universe - Observational and Theoretical Aspects held in Geltow Postdam, Germany during September 18-24, 1994 and gave a talk on Comparison of Approximations to Gravitational Instability. He visited the Linear Accelerator Laboratory, Orsay, France, for six weeks from September 24 - November 1, 1994, as a part of the Indo-French project on Modelling of Nonlinear Effects in High Power Optical Cavities of Laser Interferometric Gravitationalwave Detectors. During his stay at Orsay, he gave a talk entitled Detection of Gravitationalwaves from Coalescing Binaries and Testing General Relativity.

### Welcome...

to Christian Boily, who has joined as post-doctoral fellow and Rainer Sachs, a student from Germany.

### and ...Farewell

to Ramen Kumar Parui, who has joined his parent organisation.

## Refresher Course in Astronomy and Astrophysics for College and University Teachers

IUCAA will conduct a Refresher Course in Astronomy and Astrophysics for postgraduate teachers in universities and colleges during May 8-26, 1995. The main idea is to enthuse interested teachers to initiate and strengthen teaching of A & A in their regular teaching programmes. The topics will include: (i) Basic Physics for Astrophysics, (ii) Stellar Structure and Evolution, (iii) Extra-galactic Astronomy and (iv) Astronomical Experiments.

The number of participants for the course will be 30. Interested persons should apply on plain paper giving their curriculum vitae, their interest in A & A, teaching and research. Applications should be supported by their Head of the Departments and it should reach the Coordinator, Core Programmes, IUCAA, by February 20, 1995. The candidates will be informed of their selection for the course by March 17, 1995.

## IUCAA B(ashes) NCRA

The sixth encounter between IUCAA and NCRA took place on December 25, 1994, on the Poona University Ground, in which IUCAA established a resounding win over NCRA by 5 wickets and with 6 overs to spare in a limited 25 overs cricket match. The b(ashes) are now with IUCAA and this recent win equalises the score between the two teams. Notable performances were by Anoop Nair (5 wickets for 7 runs) and L. Sriram Kumar (43 runs).

## International Conference on Gravitation and Cosmology (ICGC-95)

This conference will be held at IUCAA, Pune, India, during December 13-19, 1995. Participation will be by invitation only. For further information write to S.V. Dhurandhar, Chairman Local Organizing Committee, ICGC-95, IUCAA.

## Notice for IUCAA Observing Programme

IUCAA has a vigorous observing programme involving different telescopes in India and abroad. Observers from IUCAA as well as university departments have been participating in this activity. Participation involves travel for observation, followed by image processing, data analysis and theoretical modelling. Requisites are knowledge of astronomy and computer programming, but much of the needed expertise can be developed through active participation. Persons younger than 40 years of age from universities and colleges in India who are interested in the observing programme may write to Ajit Kembhavi at IUCAA. Students will be able to undertake thesis oriented or short term projects.

## PEP talks from July - December 1994

### By Locals

1.7.94 **T. Padmanabhan** Some aspects of classical electrodynamics; 25.7.94 **Bikram Phookan** (NCRA) Looking for radio emission from low surface brightness galaxies; 19.8.94 **Tarun Saini** Berry's phase in quantum mechanics; 16.9.94 **Pradeep Gothoskar** (NCRA) Jupiter SL9 collision; 30.9.94 **Sunu Engineer** Neural networks & artificial stupidity; 7.10.94 **C.R. Subrahmanya** (NCRA) Understanding the skies with radio surveys; 2.12.94 **S.D. Mohanty** Statistical theory of hypothesis testing; 7.12.94 **Y.D. Mayya** (NCRA) Disks of spiral galaxies: transparent or opaque; 23.12.94 **C. Boily** Collimated, highly wound magnetostatic fields.

### By Visitors

27.7.94 **Bernard Jones**, NORDITA, Denmark *Astrohype*; 28.7.9 **Russel Cannon**, AAT, Australia *Multi object spectroscopy, an update*; 26.8.94 **Bellanca Pascal**, *Fermat's last theorem, proof for n=4*; 8.12.94 **A. Saha**, STScI, *HST and the measurement of Ho*; 29.12.94 **A. Ashtekar**, Pennsylvania State University, USA *Geometry in physics - some unexpected applications*.

## Congratulations...

to **S.K. Srivastava**, Department of Mathematics, North-Eastern Hill University, Shillong and an Associate of IUCAA for winning the Meghnad Saha Award for Research in Theoretical Sciences under the Hari Om Ashram Trust Award for the year 1993.

## IUCAA Preprints

Listed below are the IUCAA preprints released during October to December 1994. These can be obtained from the Librarian, IUCAA.

**G.C. Anupama** *General trends of recurrent novae*, IUCAA-30/94; **V. Chickarmane and S.V. Dhurandhar** *Squeezing and dual recycling in laser interferometric gravitational wave detectors with Fabry Perot cavities*, IUCAA-31/94; **G.C. Anupama, A.K. Kembhavi and M. Elvis** *Interstellar medium in the Seyfert galaxy NGC 7172*, IUCAA-32/94; *Astronomical data centre (Version 1.0)*, IUCAA-33/94; **S. Lau** *Connection variables, the gravitational action, and boosted quasilocal stress-energy-momentum*, IUCAA-34/94; **S.V. Dhurandhar** *Possibility of detecting gravitational waves from millisecond pulsars by resonant bar antennas*, IUCAA-35/94; **A. Mahabal, A.K. Kembhavi and T. Prabhu** *A dust lane in the radio galaxy 3C 270*, IUCAA-36/94; **D. Duari and J.V. Narlikar** *The intervening galaxies hypothesis of the absorption spectra of quasi-stellar objects: some statistical studies*, IUCAA-37/94; **D. Munshi, T. Souradeep and A. Starobinsky** *Skewness of cosmic microwave background temperature fluctuations due to non-linear gravitational instability*, IUCAA-38/94 and **Biplab Bhawal** *Measurement of the time period of pulses emitted and detected by accelerated observers*, IUCAA-39/94.

### God and Celestial Mechanics

Although the law of gravitation enunciated by Isaac Newton gave a good account of the motions of planets and satellites of the Solar System, Newton himself thought that the cosmos was subject to irregularities that mounted with time, making it necessary for God to intervene occasionally to set the clockwork right again.

Pierre Simon Laplace the eighteenth century French mathematician had a greater faith in the applicability of Newton's law than Newton himself. In his five volume work called *Mecanique Celeste*, Laplace adopted a completely materialistic and deterministic outlook. He undertook and solved the ambitious problem of explaining within the Newtonian framework, the motion of all the then known eighteen bodies in the Solar System.

When he presented his work to Napoleon, the Emperor asked why his book did not mention God. Laplace is said to have replied, "I had no need of that hypothesis".

## VACATION STUDENTS

### PROGRAMME 1995

[June 5 - July 14, 1995]

IUCAA invites applications for the fifth 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. (Physics / Applied Mathematics, Astronomy, Computer Science)/ B.Tech / B.E. courses in the academic year 1995-96 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, 1995. The selected candidates will be informed by April 1, 1995.

### Visitors to IUCAA October-December 1994

M.N. Anandaram, A. Banerjee, S. Banerji, S.H. Behere, S.G. Tagare, B. Ishwar P.S. Naik, K. Shankar, R. Tikekar, P.V. Kulkarni, D.K. Chakraborty, T. Singh, B.B. Walwadkar, B. Basu, U. Khanal, D.B. Vaidya, L.K. Patel, G.G. Asgekar, S.M. Chitre, S.S. De, R. Smith, A. Omont, F. Valdes, J. Geary, A. Saha, G. Fazio, W. Forrest, C. McCreight, C.M. Bhatia, L. Radhakrishna, Soundararaja Perumal, N.C. Mathur, M.I. Savadatti, I. Khanna, Pramod Kumar, K. Wali, S. Mukherjee, A. Ashtekar, A. Saha, A. Borde, R. di Stefano, S.D. Verma, A.S. Ganguly, Gurbax Singh.

### Visitors Expected

**January:** A. Induruwa, University of Moratuwa; J. Groff, Infodesign; B. Segal, CERN; M. Sommani, CNUCE; S. Ramani, NCST; S. Ramakrishnan, DOE; P.G.L. Leach, University of Natal; K. Govinder, University of Natal; D.K. Chakraborty, Ravishankar University; T. Singh, Banaras Hindu University; L.K. Patel, Gujarat University; R. Tikekar, Sardar Patel University; M.J. Thompson, Queen Mary & Westfield College; D. Lal, Scripps Institute of Oceanography, A. Blanchard, Observatoire de Strasbourg; R. Schaeffer, CEA-CEN Saclay; Y. Mellier Observatoire Midi-Pyrennees; F. Bouchet, Institut D' Astrophysique de Paris; B. Guiderdoni, Institut D' Astrophysique de Paris; J.P. Chieze, Centre d'Etudes de Bruyeres-le-Chatel; A. Stebbins, Fermilab.

**February:** I. Novikov, Nordita; J.Y. Vinet, Institut d'Astrophysik.

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

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