KHAGOL

THE
IUCAA
BULLETIN

Inter-University Centre for Astronomy and Astrophysics
An Autonomous Institution of the University Grants Commission

No. 16 **October 1993**

VI IAU Asian Pacific Regional Meeting on Astronomy

The 6th IAU Asian Pacific Regional Meeting on Astronomy was held at IUCAA, during August 16-20, 1993. Over 300 astronomers from 20 countries attended the conference; 200 of the participants came from the host country, India. This is the first time that India has hosted a Regional Meeting on Astronomy.

Three years ago, when IUCAA and NCRA made the proposal to the IAU Executive Committee to host this meeting, IUCAA had no buildings of its own and NCRA's office building had just come up. It was really remarkable that the Executive Committee had so much confidence in these two sprouting institutes so as to entrust them with such a large meeting. It is heartening to note that we have lived up to their expectations.

The plenary sessions were held in the mornings in the IUCAA Auditorium (which had just been completed in time for the meeting) and in the afternoons, two parallel workshop sessions were held in the IUCAA Lecture Halls (named after the ancient Indian astronomer Bhaskara).

The SOC had planned an interesting and exciting academic programme. There were plenary sessions on Stellar Physics (R. Cannon: Chemical Compositions and Ages of Globular Clusters and D. Lambert: The R Coronae Borealis Stars), Interstellar Medium (T. Hasegawa: The Large Scale Variation of the Physical Conditions of Molecular Gas in the Galaxy), Cosmology (T. Padmanabhan: Cosmology Today- Models and Constraints, K. Sato: Early Universe and Inflation and A. Starobinsky: Inflation and Cosmology), Solar Physics (S.M. Chitre: Probing the Solar Interior and T. Kosugi: The Yohkoh Result), Astronomical Instrumentation and New Observing Facilities (Ye Shuhua: New Observing Facilities and Instrumentation in China, S.N. Tandon: Plans for Large Indian Telescope, S. Ananthakrishnan: Giant Metrewave Radio Telescope, H. Nakajima: New Nobeyama Radioheliograph, N. Kaifu: Subaru Project, D. Enard: Concept and Status of the ESO Very Large Telescope Project and P. Hall : The Australia Telescope), QSO and AGN (J. J. Perry: Activity in the Nuclei of Galaxies: Symbiosis of Starbursts and Black Holes?, Gopal Krishna: Unified Schemes for Radio-Loud AGN and R.W. Hunstead: The Lyman Alpha Absorbers as Probes of the High Redshift Universe) and Pulsars (M. Bailes: New Lessons from Old Pulsars). In addition, there were discussion sessions on Teaching of Astronomy, Regional Cooperation in A & A and Astronomy in Antarctica. In the afternoons, there were workshops corresponding to the plenary sessions.

Participants of VI IAU APRM on Astronomy

Two evening lectures were organized to commemorate two eminent Indian Astronomers, Meghnad Saha and Vainu Bappu. Saha's Birth Centenary occurs this year and was celebrated with D. de Vorkin's talk on 'Saha's Influence on Modern American Astrophysics'. Tom Gehrels delivered the Vainu Bappu Lecture on 'The Beauty and Danger of Comets and Asteroids'.

A trip was arranged on the afternoon of August 18, 1993 to the GMRT site, about 80 km. north of Pune and over 200 delegates went to see the progress of the GMRT project; on their return, there was a conference banquet held at the Turf Club House. The delegates were treated to a Kathak dance recital by Rohini Bhate and her troupe, at a cultural evening on August 19, 1993.

Tom Gehrels enacting the expected fall of Comet Shoemaker-Levy 9, into Jupiter in July 1994.

Parsecstones in Astronomy - 4 *J V Narlikar*

Advent of the Heliocentric Theory

From sometime in the first half of the sixteenth century to sometime in the second half of the seventeenth, a major revolution took place in man's perception of his position in the universe. This period may seem too long in modern terms but seen in terms of the slow motion progress of science in earlier times, it was very important and far reaching.

In the golden era of Greek astronomy, Hipparchus (190-120 B.C.) and Ptolemy (A.D. 85-165) had perfected the geocentric theory which described the stellar and the planetary system as revolving around the fixed Earth. The stars were relatively easy to describe in this framework, but the planets with their apparently irregular motions were more difficult to fit in.

Guided by Aristotle's penchant for circles as paths for natural motions, the Greeks wanted to describe a typical planetary path as a circle whose centre moved on another circle, whose centre moved on a third circle...and so on, with the final circle in the series going around the fixed Earth. These circles came to be known as epicycles, and Ptolemy's book *Syntaxis* which became better known through its Arab translation as *Almagest* was regarded as the last word in the subject for fifteen centuries.

It was against this well entrenched belief in the fixed Earth theory which had become a religious dogma in Europe that we must view the Copernican revolution. First in a monograph called *Commentariolus* and later in the detailed volume *de revolutionibus orbium caelestium* which he saw completed in 1543 when he was on his death bed, Nicolas Copernicus proposed the heliocentric theory. (Did the word *revolution* acquire its meaning of 'a major and violent change' from the title of this book ?)

Copernicus showed that the motions of the planets are considerably simplified if one shifts the centre point from the Earth to the Sun, with the former also moving around the latter. He too had to use epicycles to describe planetary paths, however. It was Johannes Kepler in the early seventeenth century who first obtained the correct picture of planetary paths. He showed that they move in elliptical orbits with the Sun as one of the two foci. Thanks to the work of Kepler and his contemporary Galileo Gallilei who launched a major campaign not only against the geocentric theory but also against the entire Aristotelian natural philosophy, the Copernican revolution reached a successful completion.

However, the bulk of the controversy surrounding the heliocentric theory arose because it was trying to replace what had become a religious tenet. As mentioned in an earlier issue of Khagol (see Parsecstones in Astronomy - 2, No.14, April 1993), the scientific evidence that the Earth is not fixed but moves around the Sun came much later, in the eighteenth and nineteenth centuries through measurements aberration and parallax.

For the meeting, a colourful shamiana (marquee) was erected on the front verandah of IUCAA; here lunch and dinner were served each day in a festive and congenial atmosphere.

Gauging by the overall atmosphere during the meeting and the letters of appreciation we have been receiving, it would be fair to say that it was very successful meeting.

Minischool on Numerical Relativity

Nigel T. Bishop of University of South Africa visited IUCAA during June 28 - July 6 , 1993 and conducted a course on *Initial Value and Characteristic Cauchy Problem i n General Relativity*. It was attended by 8 research workers from IUCAA and outside.

Vacation Students' Programme

The Vacation Students' Programme (VSP) was conducted at IUCAA during June 1 - July 15, 1993. Under this programme 12 students were selected to spend 6 weeks at IUCAA and completed projects under supervision of 10 of the IUCAA faculty members and post-docs. A total of 23 lectures were delivered by the academic staff of IUCAA and NCRA during the programme.

The VSP participants

Secondary School Teachers ' Meet

Following the 6th IAU Asian Pacific Regional Meeting on Astronomy, a two day workshop on Astronomy for secondary school teachers was organised at IUCAA on August 22 and 23, 1993 by A.H. Batten, Chairman, IAU Working Group for the Worldwide Development of Astronomy. There were 60 participants with only two, one each from Bangladesh and Nepal, coming from outside India, though, we had sought participation from the SAARC countries. A . H. Batten, Darrel Hoff, S. Isobe, C. Iwaniszewska, J.V. Narlikar and N. Raghavan gave lectures and conducted participatory exercises on how to teach simple and basic astronomical concepts to school students. There was a good deal of enthusiasm among the participants.

Miniworkshop on Cataclysmic Variables

A miniworkshop on Cataclysmic Variables (CVs) was held at IUCAA during August 23 - 25, 1993. About fifteen scientists and students actively involved in research on CVs and related fields participated. The workshop discussed several aspects of CVs such as their evolution, accretion discs around CVs, magnetic CVs in globular clusters, multiwavelength studies of novae and I-ray detection from AM Her stars.

Marathi Science Writers' Meet

The Marathi Vidnyan Parishad in collaboration with IUCAA, conducted the ninth meeting of Marathi science writers on the IUCAA campus on September 10 - 11, 1993. More than hundred writers participated from different parts of the state of Maharashtra. The meeting was opened with an address by Vidyadhar Gokhale, a distinguished playwright and journalist. Gokhale highlighted the need for science popularisation and the development of the scientific temper with special emphasis on informing the mass, the difference between real science and pseudo-science.

The meeting had five workshops, discussing the state of science reporting and science writing in newspapers, the problems of translations of science books and articles, the need for revamping current science textbooks in schools, the ways of spreading the scientific temper and the challenges of writing good science fiction. A public session in the city highlighted the new vocational training methods being tried near Pune by S. Kalbag, and a review of India's space programme by E. Chitnis. In both these lectures, the emphasis was how new techniques of science and technology could be harnessed for the welfare of the society.

Congratulations

We congratulate **Gopal Krishna** (NCRA) and **S.R. Gadre** (University of Poona) , recipients of the prestigious Shanti Swarup Bhatnagar Award.

Measuring Distance to Moon

Distances of astronomical bodies are a direct measure of the scale of universe; they also relate the observed angular sizes and fluxes to the absolute sizes and luminosities of the objects. Thus, measurement of distances plays a very fundamental role in astronomy. One of the direct methods of measuring distances is parallax, and it has been applied successfully to measure distances within the solar system and to stars in the neighbourhood of Sun. Here we shall briefly describe a procedure to estimate distance to Moon by the method of parallax.

Parallax refers to the observed variation in the apparent position (e.g. , with reference to the background) of an object when the observer moves. For our purpose here, parallax of an object S (see Fig. 1) for a baseline O_1O_2 is defined as $\angle O_1SO_2$. It is seen that if ΔO_1SO_2 is such that $\angle O_1 = \angle O_2$, and $\angle S$ is small, $O_1S = O_2S \approx O_1O_2 \div (\angle S)$, where $\angle S$ is measured in radians.

Fig. 1: The relation of parallax to distance

Distance to Moon

It is seen from the above relation between parallax and distance that in order to get substantial parallax, the baseline should not be too small in relation to the distance to be measured. Although, for an accurate astronomical telescope , one second of arc is a substantial angle, for a simpler observational procedure using unaided eye about half a degree can be taken as a substantial angle --it is worth pointing out here that the angular diameter of Moon is nearly half a degree. Since angular size of the baseline as seen from Moon is same as the parallax (see Fig. 1), it follows that the baseline for the observations should be a few thousand kilometres. Such a baseline can be obtained by choosing two suitable points on Earth and making simultaneous observations of Moon's angle from these points. This would be a very tough exercise, but for the fact that Earth's spin carries us over a large circle everyday. If we carefully choose the times for making the measurements of lunar angle, we could get a large effective baseline without moving from our terrace.

Baseline Generated by Earth's Spin

Let us imagine that we are on the equator and Moon is in the equatorial plane (see Fig. 2). If we measure Moon's angle two hours after moonrise and two hours before moonset, the baseline O_1O_2 can be calculated by noting that $\angle O_1CO_2 = 120^\circ$, i.e., 15° for every hour of time lapse between the two observations; when we are not on the equator, a correction has to be made for the corresponding latitude.

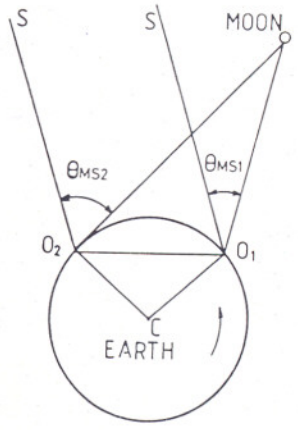


Fig . 2: The use of Earth's motion to generate a baseline for the parallax measurement. Note that Moon has been shown very close to the Earth and its parallax is exaggerated.

Measurements of Moon's Parallax

In order to measure the parallax, Moon's angle can be measured with reference to a fixed direction from the two points O_1 and O_2 (see Fig. 2) and the difference of the angles θ_{MS1} and θ_{MS2} would be a measure of the parallax. A convenient fixed direction can be obtained by locating a star near Moon. If you refer to the Astroproject - 1 on Equatorial Sun-Dial in Khagol, No.13, January 1993, you can see that the Earth's spin provides a relation between the direction of Sun and the time. In a similar way the direction of any star (or Moon) can be obtained through a measurement of time. Let us place our eye at some point of the semicircle on piece B (see Fig. 2 of Astroproject - 1) and note down the times of rising above piece A (or setting behind piece A) t_{rm} (t_{sm}) and t_{rs} (t_{ss}) for Moon and the star respectively. The change in the angular position of Moon between the two observations is given by,

$$\Delta\theta_m = [(t_{ss} - t_{sm}) - (t_{rs} - t_{rm})] \times \frac{2\pi}{24},$$

where t's are in hours, and $\Delta\theta_m$ is in radians.

As the position of the eye is fixed for any pair of timing measurements, it is not necessary to use the full assembly of the dial for the measurements. It is adequate to simulate the upper edge of piece A by a pole pointing to the pole star, and to keep eye at a suitable point as shown in Fig. 3. In the figure, B is the beam pointing (along the earth's axis of rotation) to the pole star, P_1 and P_2 are the poles whose tops are used to fix position of the eye during the readings. P_1 and P_2 should be equal in height, and should be equidistant (> 2 m) from B. To take the readings of t_{rm}, the eye should be placed at the tip of P_1 and the rising of Moon above B should be detected to get t_{rm} (the positions of Moon and the star are indicated by the filled circles), similarly t_{rs} is obtained (the corresponding positions of Moon and the star are shown by open circles).The readings of t_{sm} and t_{ss} are similarly obtained by placing the eye on the tip of P_2.

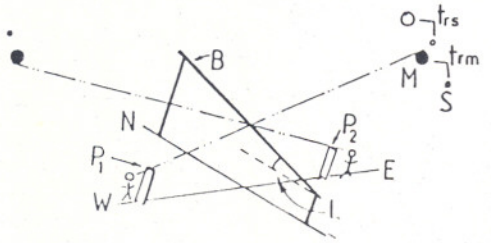


Fig.3:The observations of the times t_{rm}, t_{rs}

Precautions and Corrections in the Measurements

1. The validity of the relation between parallax and distance, as shown in Fig.1, depends on making the measurements at positions symmetrically placed on the two sides of the meridian, i.e., if the first readings (t_{rs} and t_{rm}) are 2 hrs after moonrise, the second readings (t_{ss} and t_{sm}) should be 2 hrs before moonset.

2. The measurements t_{rm} and t_{sm} should be made by sighting the same edge of the Moon.

3. During the two sets of readings (t_{rs} - t_{rm} and t_{ss} - t_{sm}), Moon moves in its orbit and its angle changes due to this motion. A correction should be applied for this by adding an angle (t_{sm} - t_{rm}) x 0.00957 radians, to the measured $\Delta\theta_m$; this correction is larger than the parallax itself.

4. Moon is not necessarily on the equatorial plane, and when it is not, the parallax is obtained by multiplying corrected $\Delta\theta_m$ by cosine of the declination of Moon; this correction could be upto about 10 per cent.

The distance to Moon can now be estimated by multiplying the baseline (corresponding to the two sets of readings) with the corrected value of the parallax.

Lecture Series

C.V. Vishveshwara, IIA, Bangalore, gave a series of 4 lectures on *Spacetime Symmetries* on March 30, 31 and April 6, 7, 1993 at IUCAA. These lectures were intended for the IUCAA-NCRA graduate students. [This report was inadvertently missed out in the last Khagol , No. 15, July 1993].

A. Starobinsky, Landau Institute for Theoretical Physics, Moscow, had given a series of 6 lectures on *Cosmology and Quantum Field Theory in Curved Space-time* on August 30, September 1, 2, 6, 8, 9, 1993 at IUCAA.

Science Programmes for Schools

On September 11, 1993 it was heartening to see IUCAA's newly built auditorium overflowing past its capacity of 500. The reason? The third programme in the newly instituted series directed at secondary schools. To be held on every second Saturday of the month, the lecture demonstrations aim at conveying the excitement of doing science to secondary school students.

The first lectures were delivered by Ajit Kembhavi (in Marathi) and N.C. Rana (in English) on July 10. The second lectures by Jayant Narlikar (in Marathi and English) on August 14 and the third one (in English) by Ranjan Gupta and Arvind Paranjpye on September 11. This series will continue.

Is it an open and shut case?
Russel Cannon makes his point

Indo-US Workshop on AGN and Quasars

The Indo-US workshop on AGN and Quasars, supported by the Smithsonian Institution, will be held at IUCAA during December 6 - 18, 1993. The workshop is meant for active research workers and students working in the general field of AGN and Quasars as well as in related areas. The speakers from abraod will include: G. Burbidge, A. Cavaliere, M. Elvis, J. Ferland, P.M. Gondhalekar, M.A. Malkan and P.J. McCarthy. There will also be several speakers from India. The programme will include lectures, seminars and discussions. Those interested may write to **The Coordinator, Core Programmes, IUCAA.** The application should include a statement of research interest and students should ask their thesis supervisor to send a letter of recommendation. Participation will be by invitation only. The funds for travel and stay will be provided.

Workshop on Astroparticle Physics

(Co-sponsored by S.N. Bose Centre for Basic Sciences)

A workshop on Astroparticle Physics will be organised at IUCAA, **(Co-sponsored by S.N. Bose Centre for Basic Sciences,Calcutta)**, during February 21 - 26, 1994. The workshop will consist of a series of invited review talks covering cosmology and particle physics, solar neutrino problem, inflationary models, baryogenesis, detection of WIMPS in the laboratory, experiments on neutrino mass, supernovae and astroparticle physics, etc. In addition, there will also be a few seminars on selected topics. Participation is limited to about 25 persons. Limited funding for travel will be available and local hospitality will be provided to all selected participants. Those who are interested in attending the workshop should write to **The Coordinator, Core Programmes, IUCAA,** giving their bio-data and research interest. Applications should reach IUCAA by December 10, 1993.

FELLOWSHIPS

The UGC has allotted two doctoral research fellowships to IUCAA for foreign students. The tenure of fellowship will be 4 years and it provides for living expenses, medical care and a modest book grant. The interested persons are requested to collect details from **The Coordinator, Core Programmes, IUCAA.**

Seminars held during July - September, 1993

1.7.93 N.T. Bishop on *Is Superluminal Travel A Theoretical Possibility?*, 2.7.93 R. Ramachandran on *Spin Manifolds and the Standard Particle Physics Model*, 15.7.93 Himadri Gupta on *Wavelet Transform of Coalescing Binary Chirp Signal*, 29.7.93 J.L. Osborne on *Observational TeV Gamma Ray Astronomy*, 2.8.93 Surya Narayan Nayak on *Signature of CP Violation in Astrophysics and Cosmology*, 10.8.93 J.S. Bagla on *Frozen Potential Approximation*, 26.8.93 E. Regös on *The Real Value of* Ω_o *and the Biasing Factor*, 1.9.93 Judith Perry on *Activity in Galactic Nuclei: New Theoretical Insights*, 7.9.93 A. Starobinsky on *Late Time Asymptote of Gravitational Instability in the Burgers Equation*, 28.9.93 Ashok Goyal on *Soliton stars* and 30.9.93 Subhash Karbelkar on *Summing up a Path in Statistical Optics*

IUCAA Preprints

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

Bagla J.S. and T. Padmanabhan *Non-linear evolution of density perturbations*, IUCAA-22/93, Balasubramanian R. and Dhurandhar S.V., *Performance of Newtonian Filters in the Detection of Gravitational Radiation from Coalescing Binaries*, IUCAA-21/1993; Dadhich N., Patel L.K. and Tikekar R., *Singularity Free Spacetimes I: Metric and Fluid Models*, IUCAA- 19/1993; Dadhich N. and Patel L.K., *On Singularity Free Spacetimes II: Geodesic Completeness*, IUCAA-20/1993 *and* Padmanabhan T. and Subramanian K., *Baryonic Content of Galactic Halos and Constraints on Models for Structure Formation*, IUCAA-23/1993.

Panel discussion on Regional Cooperation in A & A

Visitors to IUCAA during July to September 1993

V.R. Venugopal, S.K. Pandey, J.L. Osborne, S.R. Nayak, R. Ramachandran, Patrick Das Gupta, S.M. Alladin, K.S.V.S. Narasimhan, C.A. Tout, E. Regos, V.N. Shrikhande, Pramod Kumar, S. Bujarbarua, S.S. Jha, B.K. Agrawal, M.I. Savadatti, M.D. Tiwari, T.P. Prabhu, P. Ghosh, A. Ray, J. J. Perry, A.A. Starobinsky and A. Goyal.

Visitors Expected during October - December 1993

J. Batt, Mathematisches Institut, Munich ; S. Sridhar, Caltech; S.G. Tagare, University of Hyderbabd ; (October); B. Ishwar, University of Bihar; Sai Iyer, PRL; D.B. Vaidya, Gujarat College; S.D. Verma, Gujarat University; (November); A. Ashtekar, Pennsylvania State University; G. Burbidge, University of California; Martin Elvis, Harvard Smithsonian Centre for Astrophysics; G. Fazio, Smithsonian Institute; G.J. Ferland, University of Kentucky; Mathew Malkan, University of California; Patrick J. McCarthy, Carnegie Observatory (December).

A Year of PEP-Talking

PEP-TALK, within a year of its inception, has firmly established itself as a regular feature of the academic activities of IUCAA. Even the relatively odd hours at which it is held (alternate Fridays at 8:40 p.m.), has not proved to be a hindrance to the locals as well as visitors patronising it very enthusiastically. PEP- TALK has certainly come to stay.

By Locals

16.7.93 Ramesh Sinha (NCRA) on Galactic Centre, 30.7.93 Biplab Bhawal on Accelerated Observers, 6.8.93 J.V. Narlikar on The Many Faces of Mach, 27.8.93 Pramesh Rao (NCRA) on Improving Angular Resolution Using 'Seeing', 10.9.93 T. Padmanabhan on Quantum Cosmology Without Tears.

and by Visitors

13.8.93 Deshdeep Sahdev (IIT, Kanpur) on Higher Dimensional Cosmology: A Particle Physics Viewpoint.

Visit Abroad

A.K.Kembhavi attended the IAU Symposium 159 on Active Galactic Nuclei at Geneva during August 30 to September 3, 1993.

IAGRG Silver Jubilee Conference

1994 happens to be the Silver Jubilee year of Indian Association for General Relativity and Gravitation (IAGRG). It is planned to hold an IAGRG Silver Jubilee Conference at IUCAA during February 14 - 18, 1994. The academic programme will consist of plenary sessions and sessions of contributed papers. Those who wish to contribute research papers at the conference are requested to send the abstracts (not exceeding 150 words) of their papers to T. Padmanabhan, IUCAA, so as to reach him by November 30, 1993.

The registration fee for the conference will be Rs.100/- for the participants and Rs.250/- for each accompanying person, which will be collected at the time of the registration. Those intending to participate in the conference should write to **The Coordinator, Core Programmes, IUCAA,** so as to reach him by November 30, 1993.

Postponements

The workshop on **Astronomy Curriculum in Schools,** scheduled to be held during October 25-31, 1993 is postponed to April 4-8, 1994.

The Indo-French School on **'Understanding Large Scale Structures in the Universe'** has been postponed. The new date will be announced in a future issue of Khagol.

An Update

The **XX IAU International School for Young Astronomers** will be held at IUCAA during January 3 - 21, 1994.

Skyfile - 3 *Arvind Paranjpye*

Transit of Mercury

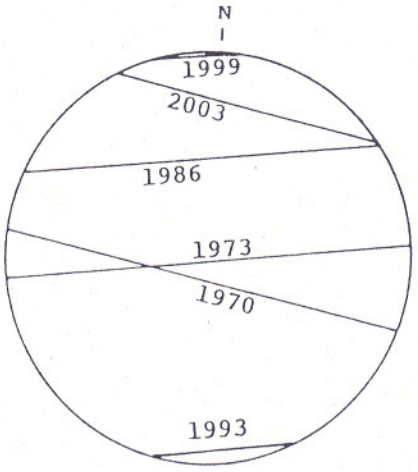
On November 6, 1993, transit of Mercury will take place and this will be observable from every part of India.

When a planet is seen travelling across the disk of the Sun, the phenomenon is called the transit of that planet. Naturally we can, from the Earth, see the transit of Mercury and Venus only.

The Mercury will touch the disk of the Sun (Ingress, exterior contact) at 8h 35m 52.7s IST and it will be completely on the disk (Ingress, interior contact) at 8h 41m 46.2s IST. The front travelling end of Mercury then will touch the edge of the Sun (Egress, interior contact) at 10h 11m 21.4s IST and at 10h 17m 14.8s IST, the planet will be outside the disk of the Sun (Egress, exterior contact).

This transit is going to be near grazing, that is the path of the transit will be on the outer edges of the Sun as shown in the figure on the next column. The figure also shows paths of some of the past and future transits

It is advised that one should not look at the Sun directly. To observe, it is best to project the image of the Sun on a sheet of a paper as described in the Khagol, No. 14, April 1993.



Ashtekar's New Centre

The Pennsylvania State University has invited Abhay Ashtekar (who is a Visiting Professor of IUCAA) to take the responsibility of setting up of a new Centre for Gravitational Physics and Geometry. The Centre was formally inaugurated on August 27, 1993 with a day long seminar, which was attended by John Wheeler, Roger Penrose, Ted Newman, Lee Smolin, Ted Jacobson, Jorge Pullin and others. Abhay is the Director of the Centre (holder of the Eberly Family Chair in Physics) and others on the faculty include Roger Penrose, Lee Smolin and Jorge Pullin. On this occasion, we congratulate Abhay and his colleagues most heartily and wish the Centre all the best.

The Unlucky Astronomer

The astronomers, who jet half way round the world to find their hard earned observing nights clouded out may be interested to know of the hazards of a bygone era.

Guillaume Le Gentil was deputed by the King of France to observe the transit of Venus from Pondicherry in the French colony in India in 1761. He started for India well in time but because of the seven year war between France and England, he was forced to take detours and arrived too late for the observing event. He stayed on , in the hope of watching the second transit eight years later only to find the sky overcast on the crucial day.

On his way back to France, Le Gentil was twice shipwrecked en-route and when he finally made it to Paris he found that during his long absence he had been declared "legally dead" and his property given away.

Astronomical Data Centre

The DST sponsored Astronomical Data Centre (ADC) at IUCAA is now fully functional and can be accessed by remote login and other more traditional means. Hundreds of catalogues are now available with the ADC together with the software required to access the catalogues with ease to obtain data across catalogues. Data is sup plied to users at request and funds are available for users to visit IUCAA for a thorough study of the available material. Details necessary for the use of the Data Centre are available with **The In-charge, Astronomical Data Centre, IUCAA.**

Welcome...

to Biplab Bhawal, Masafumi Seriu, Shiv K. Sethi and Monica Valluri; they have joined IUCAA as post-doctoral fellows.

...and Farewell

to Abhijit Kshirsagar, who has joined the Raman Research Institute, Bangalore, and Navita Srivastava, who has joined the Department of Physics, A.P.S. University, Rewa.

How to communicate with IUCAA

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