KHAGOL

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

No. 29 **January 1997**

The Eighth IUCAA Foundation Day Lecture

Professor Suma Chitnis, the Director, J.N. Tata Endowment for the Higher Education of the Indians, was the Foundation Day Speaker. Her topic was: *Crisis in Higher Education.*

Welcoming her to IUCAA, the Director mentioned that with a distinguished career at the Tata Institute of Social Sciences and as Vice-Chancellor of the S.N.D.T. Women's University for six years and with her other involvements in educational activities, Suma Chitnis was eminently qualified to talk on this topic.

Suma Chitnis began with several instances which are symptomatic of the serious trouble brewing in the sphere of higher education in the country. This was evident, she said, in the breakdown of the system in the performance of basic tasks such as admissions, framing of syllabi, conduct of examinations, declaration of results etc. These visible failures are only surface tensions symptomatic of a much deeper crisis in the system.

She traced the origins of the crisis to several factors, including a much too rapid expansion of higher education after India's independence, the many new and difficult functions being imposed on the system that had been designed with very different objectives, the conflict in perceptions of a merit oriented old system and a new egalitarian system trying to assert itself, and the progressive utilization of the system towards political ends.

She stressed that the crises were found in other countries also and their origins and motivations are not necessarily the same as here. However, so far as India is concerned she felt strongly that there was need for enlightened and educated masses to speak out and take more than a passive role in shaping the country's educational scenario. She reminded the audience that in the pre-independence India, public dialogue with the government used to take place and had been effective. She hoped for a similar course of action which is urgently needed to halt and reverse the declining standards of higher education.

Professor Suma Chitnis delivering the 8th IUCAA Foundation Day Lecture

Understanding of Stellar Structure

The H-R Diagram and the Saha Equation (*see* Parsecstone 16) provided the basic tools for classifying stars empirically in terms of their visible surface properties. Questions relating to a deeper understanding of stars, such as: what makes a star shine, what are the forces controlling its equilibrium, how does energy propagate outwards within its interior, etc. could now be meaningfully posed.

It was Arthur Stanley Eddington who pioneered the subject of stellar structure. Eddington's equations of stellar structure basically formulated the physics behind the questions posed above. Solving these equations, Eddington could deduce that the stellar interior would typically be made of hot plasma whose temperature falls outwards from a very high central value of upwards of ten million degrees. Likewise its thermal and radiation pressures decrease outwards, thereby supplying the force necessary to keep it in equilibrium against its own gravity.

It is these high core temperatures that hold the key to the secret of stellar energy. Following the ideas of J. Perrin, Eddington argued that temperatures of such high order would induce thermonuclear fusion, leading to the formation of helium from the fusion of hydrogen nuclei.

In a hot plasma, hydrogen nuclei are stripped of their electrons and move freely. But how could four such positively charged particles overcome their Coulomb repulsion and fuse together? The nuclear physicists were sceptical of Eddington's ideas and felt that even at the high temperatures he was talking about nuclear fusion would not happen. In his classic book, *The Internal Constitution of the Stars,* published in the mid-twenties Eddington poured scorn on his critics: "We do not argue with the critic who urges that the stars are not hot enough for this process; we tell him to go and find a hotter place."

Within a decade, however, the nature of nuclear force whose attractive power at close range dwarfs any Coulomb repulsion, became established and Eddington's conjecture was proved. In 1939 Hans Bethe, a nuclear physicist, constructed solar models in which the then available information on thermonuclear fusion was put in. With this work, it became possible to predict the physical characteristics of a star like its radius, surface temperature and colour, its luminosity, etc., given its mass. For this landmark work, Bethe was awarded the Nobel Prize in 1967. Unfortunately Eddington was long dead by then.

ABDUS SALAM

January 29, 1926 - November 21, 1996

IUCAA deeply mourns the passing away of Professor Abdus Salam who was one of IUCAA's Honorary Fellows right from the day the Centre was born. Going beyond the IUCAA family, Professor Salam's loss will be felt, not only all over the Indian subcontinent, but over the entire scientific Third World. A Nobel Laureate in theoretical physics, the late Professor Salam was concerned with improving the lot of up and coming scientists of the Third World for whom he created the highly innovative International Centre for Theoretical Physics and the Third World Academy of Sciences. While his scientific contributions will remain enshrined in textbooks, his efforts and legacy for the scientific brainpower of the Third World will continue to inspire the coming generations. IUCAA pays homage to this sage scientist.

Vacation Students' Programme 1997

IUCAA invites applications for the seventh 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/electronics) / B.Tech./B.E. courses in the academic year 1997-98 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, 1997**. The selected candidates will be informed by April 1, 1997 for the programme to be held during June 2- July 11, 1997.

IUCAA Publications

Singularities, Black Holes and Cosmic Censorship

Edited by Pankaj S. Joshi (TIFR, Bombay).

ISBN : 81-900378-2-X

Price : (soft back) US $ 9.00 International, including Air-mail postage & Rs. 90.00 India
(hardback) US $ 15.00 International, including Air-mail postage & Rs. 150.00 India

This volume presents a collection of lectures delivered at the Symposium (December 1995) organized on the occasion of the Fortieth Anniversary of the Raychaudhuri Equation. The topics chosen aim at providing a review of several interesting recent developments, and attempt a discussion of the state-of-the-art in the subject. The contents include a forward by P. S. Joshi and Sumit R. Das, an account by A.K. Raychaudhuri of the events which led to his work, and the introductory article by J.V. Narlikar, *My Encounter with the AKR and his Equation*; followed by the articles *Geometry of Black Holes and Multi-Black-Holes* by Dieter Brill, *Singularities: Boundaries or Internal Points?* by Chris Clarke, a review on recent developments on *Gravitational Collapse* by P. S. Joshi, and *Cosmological Singularities* by P. Szekeres.

Some Aspects of Gravitation and Cosmology

Edited by Jayant Narlikar (IUCAA, Pune).

ISBN : 81-900378-1-1

Price : US $ 12.00 International, including Air-mail postage & Rs. 120.00 India

This book is a collection of lectures delivered at the Silver Jubilee Conference of the Indian Association for General Relativity and Gravitation held at Pune. Contents include, a foreword by the Editor, Jayant Narlikar, followed by a historical introduction to IAGRG and the growth of GRG in India, by P.C. Vaidya, a critique of big bang cosmology by Fred Hoyle entitled *How successful is the big bang?*, *The new gravitational wave antenna system with noncontacting readout at the University of Western Australia* by David Blair, et al., *Numerical relativity of null cones* by Nigel Bishop, *Quasinormal models and the grin of the Cheshire cat* by Nils Anderson, *Spacetime modes and some solutions of the field equations* by Sunil Maharaj, *The search for the most symmetric superstring* by Lars Brink and *Experimental gravitation in India: Progress, challenges and prospects* by C.S. Unnikrishnan.

Ordering Information :

Contact Address	:	Library, IUCAA, Post Bag 4, Ganeshkhind, Pune 411 007, INDIA
International orders	:	Only by Demand Draft in favour of IUCAA
Inland orders	:	Within Pune : Banker's Cheque in favour of IUCAA
Outstation orders	:	Only by Demand Draft payable at Pune in favour of IUCAA

Comet Hale-Bopp

On the night of July 23, 1995 Alan Hale and Thomas Bopp, independently discovered a comet in the constellation Sagittarius. The comet was close to the globular cluster M70. This comet was named Hale-Bopp after its discoverers. The comet is designated as C/1995 O1. This comet will be the most talked about heavenly body for next four or five months. Soon after its discovery it was realized that the comet will put on an impressive display. The last comet that had put up a similar display was Comet West. Comet West, with its long and fan shaped tail, was easily visible in the dawn sky of March 1965.

Incidentally, R. H. McNaught of Anglo-Australian Observatory found a pre-discovery image of this comet on a plate exposed on April 27, 1993, by C. P. Cass.

The Comet Hyakutake, discovered early this year stole the credit from Comet Hale-Bopp of being the most spectacular comet since the Comet West. Comet Hyakutake was a bright comet in a great hurry. Its naked eye visibility was very short. However, comet Hale-Bopp will be visible for a much longer time.

Since its discovery, Comet Hale-Bopp has been well observed. The comet is behaving more or less as predicted. Towards the end of 1996, it was even spotted by many observers all over the world.

Here we discuss the comet's appearance over the Indian subcontinent. More information can be collected on the Internet from the sources given in the box at the end of this article. Figures 1 & 2 show the Altitude and Azimuth of the comet calculated for 22° North latitude. Numbers on the figure are date/month, e.g. 5/1 indicates position of the comet on 5th of January. The morning positions are plotted for half an hour before the sunrise and the evening position are plotted for half an hour after the sun set. Please check local timings for sunrise and sunset. The general direction of the tail drawn is based on the position of the sun. The table on the right gives coordinates of the comet for those who would like to do any calculations.

During **January 1997,** viewers with binoculars and telescopes might be able to pick the comet up just before the sunrise around the 8th.

After the new moon on the 9th, the comet can be observed against the dark sky. As the comet climbs above the horizon, it also brightens up and its tail becomes longer. The full moon on 23rd will cause some trouble in observing the comet. Comet enters the summer triangle on the last day of this month. This large triangle is formed by Altair (Shravan) in Aquila, Vega (Abhijit) in Lgra and Deneb (Hans) in Cygnus.

During **February 1997,** the comet passes within half a degree of globular cluster M71 on the 6th and about 40° North of the thin crescent of the Moon. Morning sky also has Venus and Jupiter in the east. New moon is on 7th. Continuing its climb, Comet Hale-Bopp attains its highest elevation above the horizon on 19th. These days are the best for taking long exposure photographs of the comet. Full moon is on 22nd and again the morning is flooded by its light.

Date	Right Assension h m	Declination o "	Mag.
1.1.1997	18 42	4 48	3.9
5.1.1997	18 49	5 49	3.7
10.1.1997	18 57	7 12	3.5
15.1.1997	19 5	8 45	3.3
20.1.1997	19 15	10 29	3.1
25.1.1997	19 25	12 25	2.9
1.2.1997	19 41	15 32	2.5
5.2.1997	19 51	17 33	2.3
10.2.1997	20 5	20 19	2.1
15.2.1997	20 21	23 23	1.8
20.2.1997	20 40	26 44	1.5
25.2.1997	21 2	30 21	1.3
1.3.1997	21 22	33 22	1.1
5.3.1997	21 46	36 24	.9
10.3.1997	22 21	39 59	.7
15.3.1997	23 3	43 2	.5
20.3.1997	23 50	45 5	.4
25.3.1997	0 40	45 49	.3
1.4.1997	1 48	44 30	.4
5.4.1997	2 23	42 43	.4
10.4.1997	3 1	39 49	.6
15.4.1997	3 32	36 32	.7
20.4.1997	3 58	33 7	.9
25.4.1997	4 19	29 45	1.1
1.5.1997	4 41	25 55	1.4
5.5.1997	4 54	23 30	1.6
10.5.1997	5 7	20 39	1.9
15.5.1997	5 20	17 59	2.1
20.5.1997	5 31	15 29	2.3
25.5.1997	5 41	13 7	2.6
1.6.1997	5 54	10 1	2.9
5.6.1997	6 2	8 20	3.0
10.6.1997	6 10	6 19	3.2

During **March 1997,** the comet crosses 1 Astronomical Unit mark on the 9th. It is also the New Moon day. The comet is now taking a dip towards the horizon and becoming brighter. It is closest to the Earth on March 22nd. Full Moon is on 24th. On 25th the comet is below the Andromeda galaxy.

We can see from Figures 1 & 2 that from 15th of March onwards, for a few days, the comet can be seen both in the mornings as well as in the evenings. But, of course, evening sky will have bright, near Full Moon. On 21st and 22nd, the comet will be about 10° above the eastern horizon before sunrise and western horizon just after sunset.

During **April 1997,** Comet Hale-Bopp reaches its closest distance to the Sun on 1st, climbing above the western horizon. Moon is out of sight. The New Moon is on 7th. The evening sky has Orion, Auriga and Taurus and Perseus. On 7th the comet passes within one and a half degrees of open cluster M34 in Perseus. Full Moon is on 22nd. Around this time Comet Hale-Bopp is within 10° of Plerades (M45 - Krittika). By 30th it stands highest above the western horizon.

During **May & June 1997,** the comet is again sliding down towards the horizon. From May 7th to May 23rd the Moon is above the horizon in the evening. Last week of May and the first week of June gives us the last chance of observing the comet against the no Moon dark background of the sky though the monsoon cloud might be active.

The Last Word

In case it rains a lot and the sky clears up, do not miss the opportunity to observe the comet in the last week of May. It might give you one of the best views. Rains would have washed away the dust in the atmosphere leaving the sky crystal clear. The comet will be about 10 degrees above the horizon.

Comet Hale-Bopp on the Internet (some important sites)
http://encke.jpl.nasa.gov/ http://www.skypub.com/comets/comets.html http://www.kalmbach.com/astro/astronomy IUCAA plans to set up (check IUCAA URL) a Comet Hale-Bopp page and would like to add photographs of comet Hale-Bopp taken by you. So do send us the photographs (Ref. Astroproject -16 of last issue).

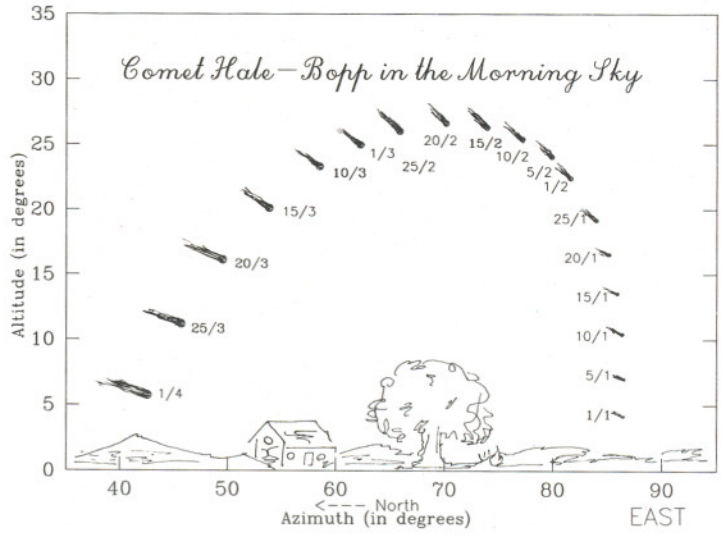

Fig. 1

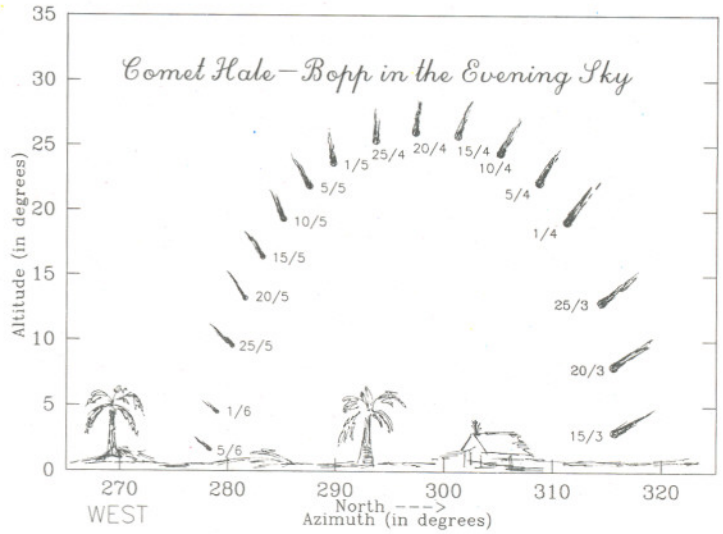

Fig. 2

Northern limit of IUCAA's Total Solar Eclipse (TSE) Project, October 14, 1996, at Sangteda, near Kotputhli, Rajasthan

Welcome to...

R. Srianand, who has joined as a faculty member of IUCAA, and

...Farewell to

Jasjeet Singh Bagla, who has joined the University of Cambridge, Institute of Astronomy, Cambridge, UK, as a post-doctoral fellow, and

Dipak Munshi, who has joined the Queen Mary and Westfield College, London, UK, as a post-doctoral fellow.

PEP Talks

held during October - December 1996

4.10.96 Kanti Jotania on *Gravitational waves a new astronomy?;* 17.10.96 J.S. Bagla on *Cosmological N-body simulations;* 31.10.96 Sayan Kar on *Geometry and Physics of Amphiphilic Membranes;* and 21.11.96 N. Jayaram Chengalur on *The measurement equation: Polarimetric interferometry made easy.*

IUCAA Preprints

Listed below are the IUCAA preprints released during October - December 1996. These can be obtained from the Librarian, IUCAA **(library@iucaa.ernet.in)**.

Ranjeev Mishra, Fulvio Melia, *The evolution of the optically thick accretion disk in novo muscae*, IUCAA-38/96; **J.S. Bagla** and **T. Padmanabhan**, *Cosmological N-body simulations*, IUCAA-39/96; **J.S. Bagla**, **Biman Nath** and **T. Padmanabhan**, *Neutral hydrogen at high redshifts as a probe of structure formation-III. Radio maps from N-body simulations*, IUCAA-40/96; Kashmira Dave, *Gravitational wave detectors*, IUCAA-41/96; **L. Sriramkumar**, R. Mukund and **T. Padmanabhan**, *Non-trivial classical backgrounds with vanishing quantum corrections*, IUCAA-42/96; **Sayan Kar**, *Scale factor duality and the energy condition inequalities*, IUCAA-43/96; Roman Tomaschitz, *Superluminal motion and causality*, IUCAA-44/96; **Ranjeev Misra**, *A transition disk model for the x-ray spectra of Seyfert 1s*, IUCAA-45/96; Roman Tomaschitz, *Topological evolution and chaos in cosmology*, IUCAA-46/96; Roman Tomaschitz, *The center of the universe*, IUCAA-47/96; **Varun Sahni**, B.S. Sathyaprakash and S.F. Shandarin, *Probing large scale structure using percolation and genus curves*, IUCAA-48/96; **S. Sridhar** and J. Touma, *Cusps without chaos*, IUCAA-49/96; **R.K. Gulati, R. Gupta** and N.K. Rao, *A comparison of synthetic and observed spectra for G-K dwarfs using artificial neural networks*, IUCAA-50/96; **R.K. Gulati, Ranjan Gupta** and H.P. Singh, *E (B-V) determinations of O and B stars using artificial neural networks,* IUCAA-51/96; Roman Tomaschitz, *Linear gravitational waves and electrodynamic formalism in cosmology,* IUCAA-52/96; and Pushpa Khare, **R. Srianand,** D.G. York, R. Green, D. Welty, Ke-Liang Huang, and J. Bechtold, *Lyman Alpha Forest towards B2 1125+317,* IUCAA-53/96.

Talks during visits abroad

Ajit Kembhavi : *Effect of Dust or Quasars*, University of McMaster, October 4; *Are there any missing Quasars?* University of Virginia, October 8; and *Quasars Obscured by Dust*, Columbia University, October 10.

Seminars

held during October - December 1996

10.10.96 Roman Tomaschitz on *Cosmic evolution by global metrical deformations of spacetime;* 11.10.96 R.P. Saxena on *Baryogenesis from evaporation of primordial black holes;* 16.10.96 Yuri Shchekinov on *Post-reheating dynamics of cosmological conductive / cooling fronts and the Ly α forest clouds;* 7.11.96 Sam Ragland on *High angular resolution in the infrared;* 3.12.96 Raghavan Rangarajan on *Gravitational baryogenesis during inflation;* 20.12.96 Biplab Bhawal on *Fast dynamical simulation of interferometric gravitational wave detector;* and 26.12.96 V.B. Johri on *Genesis of matter out of gravitational energy.*

Colloquia

held during October - December 1996

6.11.96 Thomas J. Arhens on *SPH calculations of impact of comet Shoemaker-Levy 9 on Jupiter;* and 13.11.96 R.V. Moody on *Mathematical quasi-crystals : quasi-lattices, self-similarity, and diffraction.*

Les Houches School on Starbursts : Triggers, Nature and Evolution

IUCAA was one of the sponsors of a school on **Starbursts: Triggers, Nature and Evolution** which was organised at the Centre de Physique, Les Houches, France during September 17-27, 1996.

The school was the result of collaborative efforts between Ajit Kembhavi of IUCAA and Bruno Guiderdoni of the Institut d' Astrophysique de Paris. Several distinguished speakers from different countries delivered lecture courses covering observational and theoretical aspects of various topics ranging from star formation to interacting galaxies. There were seminars by experts on areas of current interest as well as short seminars by students. About 60 participants, including 7 from India were present at the School. A book containing notes of lectures delivered at the School is being published.

Workshop on Astronomical Image Processing and the Internet

A Workshop on **Astronomical Image Processing and the Internet** was organised by Professor Prabhakaran Nayar at the Observatory, University of Kerala, Thiruvananthapuram. Lectures covering different aspects of Image Processing, Computer Networking, Computer Communication and the Internet were presented by experts from IUCAA and other organisations in Pune, Bangalore and the host city. There were about 60 participants from different Universities in Kerala as well as a few from other states. A special feature of this workshop was a complete computer network which was set up using computers from IUCAA and the observatory. The state-of-the-art network was set up using easily obtainable and inexpensive hardware. The software used was wholly obtained from the public domain without having to pay any charges. E-mail connection has now been provided to the Observatory as well as to St. Thomas College, Kozhencherry, Kerala.

The IUCAA Telescope Project

UPDATE

The telescope project was approved by the UGC about a year back (see the January 1996 issue of Khagol) and around the same time work was started towards monitoring some prospective sites, and currently two sites are being monitored for their suitability with differential-image motion seeing monitors and other instruments. After making enquiries with several reputed suppliers of 1-2 m class telescopes, an order has been placed with the Royal Greenwich Observatory (RGO), Cambridge, England, for a 2 m telescope. The telescope would have a altazimuth mount and would incorporate several other modern features to give a pointing accuracy of ~ 2 arc sec and a sub arc sec tracking accuracy. Based on the discussions at a meeting of the astronomers, from the university sector and from the national observatories, an optical imager cum spectrograph and a near infrared imager cum spectrograph have been chosen as the first two instruments. This facility, which would be primarily used by the astronomers from the Indian university sector, is expected to be operational in the year 1999.

Jayant Narlikar, Director, IUCAA, and Neil Parker of the RGO (on the right) sign the agreement for supply of the telescope

Workshop on Inhomogeneous Cosmological Models

A workshop on **Inhomogeneous Cosmological Models** (solutions of Einstein equation) was held at the North Bengal University, Siliguri, during November 14-18, 1996. It was attended by about 25 outstation participants. There was a lively discussion and critical appraisal of inhomogeneous cosmological solutions (particularly singularity-free ones) spearheaded by A.K. Raychaudhuri. In addition, there was also a discussion on conceptual issues related to black holes (radiation, entropy etc.) and quantum cosmology. The other veteran, P.C. Vaidya, provided the inspiring backdrop by his excellent account of growth of GR in India. The last two days proceedings were held at the Government Sikkim College, Gangtok, the capital of the Himalayan state, Sikkim. The workshop ended with a visit to Chongu lake at the height of 14500 ft.

Second Zel'dovich meeting on Large Scale Structure and Cosmology

The **second Zel'dovich meeting on Large Scale Structure and Cosmology** was held in IUCAA during December 16 - 20, 1996. It was attended by experts from different Indian Institutes and Universities as well as from Italy, United Kingdom, U.S.A., Germany, Portugal, Canada and Russia. The meeting included extensive discussions on fundamental issues in Cosmology such as: Structure formation and the Cosmic Microwave Background, Clusters and Superclusters of galaxies, Redshift survey's of the Universe, N-body simulations, Gravitational lensing, Lyman alpha clouds and extent of neutral hydrogen at high redshifts etc.

Congratulations to...

T. Padmanabhan on being awarded the **1996 Shanti Swarup Bhatnagar Prize in Physical Sciences**, and

J.V. Narlikar on being awarded the **1996 Kalinga Prize for the Popularization of Science** by UNESCO and the **Gajanan Madhav Muktibodh Marathi Bhashi Hindi Lekhak Puraskar - 1995-96** by the Maharashtra Rajya Hindi Sahitya Academy, Mumbai.

IUCAA evens the (B)ashes score with NCRA

IUCAA won the cricket match this year against NCRA in an exciting finish when IUCAA contained the NCRA batsmen to 109 runs in 20 overs. IUCAA had batted first scoring 111 runs in the same number of overs. The highlights of the match were a well made 41 runs by Ashish Mahabal and a superb catch held by Deepak Shinde at mid-off in the second over of the NCRA innings which gave them an early set back. However, the crowning moment (highlight?) of the match came in the last over of the IUCAA innings when the batsmen ran four runs after defensively patting the ball near the middle of the pitch, while the NCRA fieldsmen played hand ball amongst themselves. This brings bashes matches score to eight, each side winning four matches.

Visitors

October - December 1996

P.V. Subrahmanyan, P. Vivekananda Rao, R. Swaminathan, R. Tomaschitz, D.C. Srivastava, S.S. Prasad, S.N. karbelkar, Gopi Garge, P.S. Naik, R. Nityananda, R. Ramakrishna Reddy, D. Lohia, B.K. Datta, Abhay Mohan Lal, B. Ishwar, B.A. Kagali, A. Banerjee, L.K. Patel, D.B. Vaidya, S.K.Pandey, V.C. Kuriakose, R.S. Khairnar, Kesh Govinder, S. Ragland, N. Babu, S.R. Prabhakaran Nayar, Mandar Bhagwat, A. Omont, P.G.S. Mony, R.V. Moody, D.N. Verma, K.N. Joshipura, Vahid H. Hasmani, Suresh Chandra, M.C. Durgapal, Tarun Ghosh, S.D. Maharaj, Ladislav Hric, S. Vaishampayan, P.S. Wamane, E.C.G. Sudarshan, R. Rangarajan, D. Atkinson, N. Kaltcheva, V. Chitnis, S. Bharadwaj, J. Schmalzing, P. Macedo, V. Lukash, V. Chechetikine, S. Gottlober, B.S. Sathyaprakash, Mangala Sharma, S. Borgani, L. Mosscardini, A. Heavens, T.P. Singh, B. Bhawal, S. Shandarin, T. SIngh, D. Narasimha, S. Bhavsar, V.B. Johri, L.M. Saha, , M.K. Das, V.H. Kulkarni.

Visitors

Expected

January 1997: J.C. Pecker, College de France, Ulm; G.R. Burbidge, University of California, USA; H.C. Arp, Max Planck Institut, Munchen; G. Tammann, Astronomisches Institut Der Universitat Basel; David Roscoe, Sheffield University, U.K. , S.P. Khare, Charan Singh University, Meerut; C. Murali, CITA, Canada; Ramendranath Majumdar, Vivekananda College, Calcutta; Andrzej Zdziarski, Joanna Mikolajewska; G. Vekstein,UMIST, U.K; Kim Griest; R.P. Malik, Bogoliubov Laboratory of Theoretical Physics, Moscow; Jack Klobuchar; P. Biermann, Max Planck Institut, Bonn; Udit Narain, Meerut College.

February: Francoise Genova, CDS, Strasbourg; P. Hello, LAL, Orsay.

Happy New Year! **We wish to thank the readers for their response to the questionnaire sent along with the last issue of Khagol. The response was very positive and encouraging. We hope to implement some of the suggestions made by the readers from the next issue onwards.**

-Editor

Brahma and the Black Hole

A story in Indian mythology relates to a king who had a beautiful daughter. There were several suitors for her and the king was anxious to make the correct choice. Deciding to consult no less a person than Brahma, the Creator of the Universe, he took his daughter to Brahma's abode. Brahma was busy and asked him to wait a few moments, which he did.

"Tell me what is your problem", Brahma asked when he finally was free to talk to the king. The king related the purpose of his visit. *"Now, please tell me who is the suitable husband for my little girl"*, he asked. Brahma laughed and said: *"Your problem has changed; for while you were waiting for my few moments, several aeons have passed on the Earth and all those suitors are no more."* Anyway, he gave the king the name of a suitable young man who would be around when the king and the princess returned to the terra firma.

Perhaps Brahma lives in a black hole and the king met him just outside the event horizon.

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

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