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

Contents...

17th IUCAA Foundation Day Lecture

Professor Gerardus 't Hooft delivering the seventeeth Foundation Day lecture at IUCAA

The seventeenth Foundation Day lecture of IUCAA was delivered by the Nobel Laureate in Physics, Professor Gerardus 't Hooft, who spoke on *Controversies in Physics at the Planck Scale*. His talk once again reiterated the originality of vision which has been the hallmark of every piece of work which Gerardus has done in his illustrious career. After describing several peculiar aspects of gravitation and blackhole physics, he went on to point out how progress in bringing together the principles of quantum theory and gravity would require a novel way of thinking. During the last part of the talk, he outlined some aspects of such a model, in which quantum mechanics becomes deterministic at Planck scales. This is a radical departure from the conventional thinking in which quantum mechanics is interpreted along probabilistic lines.

Congratulations to...

Jayant Narlikar, on being conferred with the ***Jeevangaurav Puraskar*** by Chaturang Pratisthan, Mumbai.

Welcome to...

Professor Gerardus 't Hooft, Spinoza Institute, The Netherlands and,

Professor Juergen Ehlers, Max-Planck Institute for Gravitational Physics, Albert Einstein Institute, Golm, Germany,

who have accepted the invitation to be the Honorary Fellows of IUCAA from December 29, 2005. A very warm welcome to both Professors G. 't Hooft and Ehlers to the extended IUCAA family.

International Conference on Einstein's Legacy in the New Millennium, Puri

Partcipants of the International Conference on Einstein's Legacy in the New Millennium held at Toshali Sands, Puri

An international conference titled *Einstein's Legacy in the New Millennium* was co-organised by IUCAA, Utkal University and Institute of Physics, Bhubaneswar, at Toshali Sands, Puri, during December 15-22, 2005. This conference was co-sponsored by IAGRG, HRI (Allahabad), IMSc. (Chennai), RRI (Bangalore), SINP (Kolkata), and TIFR (Mumbai) and financial support was also received from DAE-BRNS, DST and ISRO. The aim of the conference was to bring together people working in different areas of quantum gravity and bring fruitful interactions amongst them. The plenary talks were delivered by Martin Bojowald, Atish Dabholkar, J. Ehlers, G. Gibbons, Rajesh Gopakumar, G. 't Hooft, Romesh Kaul, Swapna Mahapatra, H. Nicolai, Peter Van Nieuwenhuizen, T. Padmanabhan, Jogesh Pati, J. Pullin, Ashoke Sen, Parampreet Singh, Tarun Souradeep, Sandip Trivedi, W. Unruh, M. Varadarajan and B. de Wit. In addition to the plenary talks, the conference devoted three evenings for focused discussion on String Theory, Loop Quantum Gravity, and Cosmology coordinated by Debashis Ghoshal, Martin Bojowald and Varun Sahni.

G. 't Hooft delivered a special colloquium, which was attended by the students from the Utkal University as well. The conference was quite successful in providing a forum for very stimulating discussions and allowing free exchange of different points of view. The scientific organization of the conference was handled by a committee co-chaired by T. Padmanabhan (IUCAA) and J. Maharana (IOP) and the local organization was carried out by a committee chaired by L.P. Singh of Utkal University.

Introductory Workshop on Astronomy and Astrophysics

An Introductory Workshop on Astronomy and Astrophysics (Instruments and Observations) was organized by the Department of Physics, Karnatak University, Dharwad during December 5-7, 2005. The workshop was sponsored by IUCAA, Pune, with additional support from Karnatak University under unassigned UGC grant. The Workshop was inaugurated by Ajit Kembhavi, IUCAA with M.I. Savadatti, former Vice-Chancellor of Mangalore University speaking on the occasion. The aim of the workshop was to acquaint the teachers with the basics of Astronomy and Astrophysics, which will be helpful for teaching/introducing the topics at undergraduate and postgraduate level, to provide an opportunity for the teachers from colleges and universities to undertake research activities, and mainly to learn the latest developments in the areas.

The workshop was attended by 38 teachers from university departments and colleges from Karnataka and neighbouring states. A few students and all the research students of the department also participated actively in the workshop. The resource persons spoke as follows.

Ajit Kembhavi (IUCAA): *Galaxies* (2 lectures); Ranjan Gupta (IUCAA): *Spectroscopy, Spectroscopy Instrumentations Applications: Based on Neural Network*; Vijay Mohan (IUCAA) : *Optical Telescopes, Detectors and Image Processing*; Tarun Souradeep (IUCAA): *Introduction to Cosmology* (2 lectures); B.A. Kagali (Bangalore University): T*elescopes and their Characteristics*; S.C. Chakravarty (Department of Space, ISRO, Bangalore): *ISRO's Space Science and Astronomy Missions*

Uday S. Raikar from the Department of Physics and Ranjan Gupta from IUCAA, were the Coordinators of the Workshop, with B.G. Mulimani as Chairman of the Workshop Organising Committee.

Participants of the workshop on Astronomy and Astrophysics

Workshop on Astrostatistics

The Workshop on Astrostatistics was jointly organized by the Inter-University Centre for Astronomy and Astrophysics, Pune and Department of Statistics, Calcutta University during December 21-23, 2005. The workshop was inaugurated by Asis Kumar Banerjee, Vice Chancellor, Calcutta University on December 21, 2005.

Speakers and topics of the different technical sessions were as follows: S.P. Mukherjee (Calcutta University): *Statistics for astronomy – An overview*; G.J.Babu (Penn State University): *Statistical problems in astronomy and resampling techniques*; Ajit Kembhavi (IUCAA): *Sky is the limit*; Kalyan Das (Calcutta University): *Exploratory data analysis*; Somnath Bharadwaj (IIT Kharagpur): *Galaxy redshift surveys*; Ranjeev Misra (IUCAA): *Time series analysis of astronomical data*; Asis Kr Chattopadhyay (Calcutta University): *Statistical inference and missing data analysis*; Sugata Sen Roy (Calcutta University): *Some aspects of multivariate analysis*; Ashish Mahabal (Caltech): *Clustering, classification and the search for outlier*; P.K. Sen (North Carolina State University): *Some stochastic perspectives in astrostatistics*; Tarun Souradeep (IUCAA): *Statistics of the cosmic microwave background sky*; Manisha Pal (Calcutta University): *Descriptive statistics*; Tanuka Chattopadhyay (S.D.B. College): *Some case studies*; Sajith Philip (St Thomas College): *Bayesian Statistics for artificial neural network design*; U.C. Joshi (PRL Ahmedabad): *Probing the inner region of the milky way*; Malay Ghosh (University of Florida): *Bayesian methods*.

Besides the above technical lectures, there was a special lecture on December 22, 2005 by J.K. Bhattacharya of Indian Institute for Cultivation of Science, Calcutta on the topic "*Bose Einstein statistics and condensation phenomena*."

About sixty participants from different universities, colleges, institutes and from different parts of the country attended the workshop.

Asis Kumar Chattopadhyay of Department of Statistics, Calcutta University and Ajit Kembhavi of IUCAA, Pune were the joint Coordinators of the Workshop.

An Introductory Workshop on Sun and Stars

An Introductory Workshop on Sun and Stars was organized by IUCAA in collaboration with the Department of Astrophysics, St. Xavier's College, Kolkata during November 21-23, 2005. A total of 87 participants from different university departments and colleges attended the workshop, out of which twenty candidates were from other parts of India. The lectures given at the workshop were as follows –

The participants of the workshop on Sun and Stars

Jagdev Singh (IIA, Bangalore): Instruments and techniques to observe the Sun and structure and dynamics of the Sun; Sandip K Chakrabarti (SNBNCBS and Center for Space Physics) : Astrophysical flows about black holes and neutron stars; Ashoke K. Sen (Silchar University): Fundamentals of astronomy and photometry and polarimetry with small telescope; Ranjan Gupta (IUCAA) Earth's atmosphere, telescopes and effects and astronomical spectroscopy; Narayan Banerjee (Jadavpur University): The new turn in cosmology; Partha Sarathi Joarder (Indian Statistical Institute, Kolkata): A short introduction to solar magnetohydrodynamics; Debiprosad Duari (M.P. Birla Planetarium): Astrophysics and cosmology – Current perspectives and future challenges (Part A) and Astrophysics and cosmology – Current perspectives and future challenges (Part B); Kamales Kar (Saha Institute of Nuclear Physics, Kolkata): The theory of type II supernova explosions; Biswajit Basu (AAVSO and Sky Watchers' Association): The effect of solar flares on the VLF radiowave propagation and ionospheric disturbances. Jagdev Singh delivered one evening popular level talk on Expedition to Antarctica region to study the Sun. All the participants were taken to the St. Xavier's College Observatory, which was established in the year 1860 and is at present under renovation process since November 2004. Biswajit Basu also demonstrated a VLF receiver at the observatory for 2 days showing the ionospheric effects including sunrise and sunset events, etc.

IUCAA Preprints

Listed below are the IUCAA preprints released during October-December 2005. These can be obtained from the Librarian, IUCAA (library@iucaa.ernet.in)

Gargi Shaw, G.J. Ferland, R. Srianand and N.P. Abel, *Physical conditions in the ISM towards HD185418*, IUCAA-40/2005; Luca Amendola, Shinji Tsujikawa and M.Sami, *Phantom damping of matter perturbations*, IUCAA-41/2005; Saibal Ray, *Electromgnetic mass in (n+2) dimensional space-times*, IUCAA-42/2005; Saibal Ray, Basanti Das, Subharth Ray, Farook Rahaman, *Physical properties of Tolman-Bayin solutions: Some cases of static charged fluid spheres in general relativity*, IUCAA-43/2005; J.Bagchi, Florence Durret, Gastao B. Lima Neto, Surajit Paul and Satyajit Chavan, *High and ultra-high energy cosmic ray acceleration in structure-formation shocks in Abell 3376 galaxy cluster*, IUCAA-44/2005; Nirupam Roy, Jayaram N. Chengalur and Raghunathan Srianand, *A multiwavelength investigation of the temperature of the cold neutral medium*, IUCAA-45/2005; Rita Sinha and Tarun Souradeep, *Post-WMAP assessment of infrared cutoff in the primordial spectrum from inflation*, IUCAA-46/2005; Janine Heinmuller, Patrick Petitjean, Cedric Ledoux, Sara Caucci, Raghunathan Srianand, *Kinematics and star formation activity in the z=2.03954 damped Lyman-alpha system towards PKS 0458-020*, IUCAA-47/2005; E. Rodriguez, Patrick Petitjean, B. Aracil, C. Ledoux, R. Srianand, *Relative abundance pattern along the profile of high redshift damped Lyman-alpha systems*, IUCAA-48/2005; Abhay Ashtekar, *The winding road to quantum gravity*, IUCAA-49/2005; T. Padmanabhan, *Understanding our universe : Current status and open issues*, IUCAA-50/2005; Harinder P. Singh, Manabu Yuasa, Nawo Yamamoto, Ranjan Gupta, *Reliability checks on the Indo-Us stellar spectral library using artificial neural networks and principal component analysis*, IUCAA-51/2005.

Young Astronomers' Meet 2005

The participants of the Young Astronomers' Meet

The 9th Young Astronomers' Meet (YAM) was held in IUCAA and NCRA during November 29-December 2, 2005. YAM serves as a unique forum for research students working in Astronomy and Astrophysics in the country, by providing them a unique oppurtunity to present their work and interact with like-minded fellow-researchers. YAM was initiated in 1992 and the first one was held in NCRA. YAM 2005 was co-sponsored by DST, IUCAA and NCRA, and the organisation was handled by the graduate students of the latter two institutions under the guidance of A. N. Ramaprakash. The schedule included technical talks and poster presentations by participants covering most of the areas in A & A, as well as three special evening colloquia, by A.K. Kembhavi ("Virtual Observatories"), T. Padmanabhan ("Dark Energy") and R. Nityananda ("The graver side of light"). On the last day, a trip to GMRT and the IUCAA telescope at Giravali was arranged. The meet was attended by 81 students from various institutions across the country. In all, 35 talks and 9 posters were presented. Students from Pt. Ravishankar Shukla University, Raipur have proposed to hold the next YAM.

Vacation Students' Programme

IUCAA invites applications for the sixteenth Vacation Students' Programme (VSP). Students selected under the VSP will spend seven 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, and an interview. Those who perform well will be preselected to join IUCAA as research scholars to do Ph.D. after the completion of their degree and other requirements.

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 2006- 2007 are eligible to apply. Applications, 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, Post Bag 4, Ganeshkhind, Pune 411 007,** by March 15, 2006. The selected candidates will be informed by April 15, 2006 for the programme to be held during May 15 - June 30, 2006.

School on Cosmology and Very Early Universe

The participants of the School on Cosmology and Early Universe

Taking advantage of the presence of some of the distinguished speakers at the conference Einstein's Legacy in the new Millennium, held at Puri, a satellite School on Cosmology and Very Early Universe was organized at IUCAA during December 26-30, 2005. It was felt that the activity in both strings and loop quantum gravity is coming up to a stage for applications in cosmology and one could expose young researchers in the country to this exciting and emerging area of research. This was the main motivation for the school which was scientifically directed by Abhay Ashtekar.

It began with the lectures on cosmology (by Juergen Ehlers, T Padmanabhan, Varun Sahni, K Subramaniam and Tarun Souradeep) which defined the cosmological context and setting. It was then followed by lectures on string theory (by Sunil Mukhi, Jnan Maharana, Atish Dabholkar and Sandip Trivedi) and loop quantum gravity/cosmology (by Abhay Ashtekar, Martin Bojowald, Param Singh, Shyam Date and Golam Hossain). There were about 30 participants from various institutes and unuiversities.

It was a very intense and focused engagement which was rounded up by a panel discussion on the emerging canvas of synergy between quantum gravity theories and cosmology.

Seminars

3.10.2005 Andrea Tartari on *The cosmic microwave background frequency spectrum:Open questions and experimental problems*; 6.10.2005 Andrea Tartari on *Coherent radiometers:A physical perspective*; 10.10.2005 Abhishek Rawat on *Morphological analysis of intermediate redshift luminous compact galaxies using the HST/ACS Goods survey*; 14.10.2005 Divakara Mayya on *M82:A spiral galaxy in formation*; 3.11.2005 Alain Kerdraon on *The Nancay radioheliograph: Recent results and future developments*; 8.11.2005 Arnab Kumar Ray on *A time-dependent perturbative study of the shallow water hydraulic jump*; 8.12.2005 Dmitry Sokoloff on *The maunder minimum and the solar dynamo;* 9.12.2005 Amir Hajian Forushani on *Cosmology through CMB anisotropy*; 10.12.2005 Rita Sinha on Parameter constraints using WMAD data.

Colloquia

19.10.2005 Tom Gehrels on *Our natural inheritance and global responsibility*; 28.11.2005 Kameshwar Wali on *Bose and Einstein, and the discovery of their statistics*.

Erratum

In the report on *Workshop on Observational Astronomy with Small Telescopes* published in Khagol No. 62 (April 2005), P. Sudhakar Reddy (V.R. College, Nellore) was mentioned as one of the workshop coordinators. This was an inadvertent error. The workshop coordinator was **A. Sundar Jacob (V.R. College, Nellore)**. We regret the error.

IUCAA Associateship Programme

IUCAA is a centre of excellence for research in Astronomy and Astrophysics and related subjects, and one of its mandates is to encourage research and development in these areas in the University sector. An important component of IUCAA's academic activities is the Associateship Programme, under which faculty members of Indian universities or colleges can visit IUCAA for periods of short and long durations over a span of three years, to develop their research interest and expertise.

During these visits, Associates can conduct their own research, or work in collaboration with faculty members at IUCAA, and with visitors from India and abroad. Associates can use facilities at IUCAA like the library, the advanced computing centre and instrumentation laboratory. They can participate in observational programmes using national and international facilities, including IUCAA's own 2 m optical and infrared telescope being set up at Giravali.

The Associateship Programme has been designed to promote mobility and to this end, the travel and local living expenses of an Associate for these visits will be borne by IUCAA as per its rules. Associates will continue to carry out the existing commitments at their parent organization. However, since IUCAA has been created by the UGC as a field station for these activities, it is expected that those visiting IUCAA under this programme will be treated as on duty by their respective organization.

Applications, on plain paper, are invited under this programme for the seventeenth batch of Visiting Associates for the period from July 1, 2006 to June 30, 2009. Interested persons should forward their application through the heads of their departments or institutions, along with their biodata, list of publications and a brief write-up on the work they intend to carry out as Associates of IUCAA. Applications should be sent to **The Coordinator, Core Programmes, IUCAA, Post Bag 4, Ganeshkhind, Pune 411 007**, so as to reach before April 30, 2006. In addition, each applicant should arrange for two experts in the field to send their confidential assessment of the applicant directly to the above address. Those who had applied last year, but were not selected, are requested to update their application if they would like to be considered again for a Visiting Associateship. The selected candidates will be informed by June 15, 2006.

Farewell to...

Asim Mahmood, who has joined as a quantitative analyst in Mumbai.

Ujjaini Alam, who has joined as a Post-doctoral Fellow at ICTP, Trieste.

Visitors during October to December

Tartari Andrea, B. Ishwar, B.S. Kushwah, Soumitra Ranade, Arun Nigavekar, Kamal Kumar Tanti, Partha Sarathy Pal, Shiv Sethi, Pushpa Khare, Abhijit Bhattacharyya, Saibal Ray, D.C. Srivastava, Sudhanshu Barway, Yuri Shtanov, A.K. Sanyal, Divakara Mayya, B.C. Paul, Ranbir Dutt, Shailesh G. Kulkarni, Tom Gehrels, S.N. Tiwary, A. Kerdraon, Shyamala Krishnan Nair, Piyush G. Karia, Arnab Kumar Ray, R. Tikekar, S.D. Chavan, P.C. Vaidya, V.B. Kamble, Minu Joy, S.G. Tagare, N. Raychaudhuri, Narayan Banerjee, C.V. Vishveshwara, Ann Sayre Wiseman, Amit Pathak, Kanan Kumar Datta, Tuhin Ghosh, Kameshwar Wali, Sunder Sahaynathan, Manjari Bagchi, Himali Joshi, Arti Goyal, Kuntal Misra, Fayaz Ahmad Najar, Tabasum Masood Bhat, A.N. Sheikh, S. Sharma, Hameeda, Debarati Chatterjee, Samridhi Kulkarni, Firdous, Shilpa Thakur, Arun Kumar Diwakar, Arun Kumar Singh, Anoop Kumar Srivastava,Soubhadra Sen, Manu Sundaram, Srividya Subramanyan, C. Karthick, Naval Kishor Lohani, Sini Raghavan, Rajib Saha, Surajit Dasgupta, Vinu V., Shivprasad Shinde, Vishal Gajjar, M.V. Amaresh Kumar, Tuhin Ghosh, Dmitry Sokoloff, S. Bhattacharyya, Andrez Zdziarski, Ashok Das, Abhay Ashtekar, Pramod Musrif, Priti Bhajan Byakti, Naresh Kumar Lokre, Soumya K.S., Indira Karakoti, Purnima Pandey, Sudipta Das, Sujatha S., Sarita Vig, Ratna Koley, Veerakumar M., Jeeva V.S., Natraj Huliyar, Satheesh Kumar V.H., Nishikanta Khandai, Rajeev Kumar Jain, Supratik Pal, Anupam Das, Shakuntal Shinde, Sushma Dhannayak, N. Neelakanthan, Vinothini S., Chawre. L. Chris Boily, Ashish Mahabal, S. Ramadurai, R.K. Jain, K.M. Ajitha, D. Vaid, Anupam Das, Arif, Aseem Paranjape, Ayan Chatterjee, K. Gopal Krishna, Golam Hossain, V. Tibrewala, Soupatrik Pal, T. Prakash, Martin Bojowold, G.S. Date, J. Maharana, S. Trivedi, Sunil Mukhi, Atish Dabholkar, G. Rajasekaran, S. Dube, Budhram, Juergen Ehlers, G t'Hooft, N. Mukunda, A. Shukurov, Mark Whittle, Ujjal Debnath, Sivakumar, B.C. Paul, L. Sriramkumar, Kinjal Banerjee, N. Banerjee, P.N. Pandita and Parampreet Singh.

Visitors Expected

January

Gargi Shaw, University of Kentucky, USA; Gary Ferland, University of Kentucky, USA; A. Abraham, Christian College, Chengannur, Kerala; S. Barway, Pt.Ravishankar Shukla University, Raipur; Amit Pathak, D.D.U. Gorakhpur University, Gorakhpur; Shashi Ganesh, PRL, Ahmedabad; Rabin Chhetri, Sikkim Govt. College, Gangtok; Moncy Jhon, St.Thomas College, Kozhencherri; Pushpa Khare, Utkal University, Bhubaneshwar; V.C. Kuriakose, Cochin University of Science and Technology, Kochi; P.K. Srivastava,Kanpur; Bindu Bambah, University of Hyderabad, Hyderabad; N. Banerjee, Jadavpur University, Jadavpur; Ashok Goyal, Hansraj College, University of Delhi, Delhi; Sanjay Pandey,

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For The Younger Minds – 15

T. Padmanabhan

Consider an experiment or observation to detect a specific feature in a member of a population (e.g. a particular phenomeon in a quasar, cancer in a patient ....). Assume that the procedure is 98 % reliable. That is, if the feature exists the procedure will detect it 98% of the time and if the feature does not exist, it will rule it out 98% of the time. Further assume that the feature is known to occur in about 0.5% of the population. You find that a particular member you looked at shows this feature. What is the probability that this member actually has the feature?

Solution to *For The Younger Minds – 14*

The friction does scale as the area *of contact* but the actual area of contact is much smaller than the macroscopic area. To make an estimate consider, say, a cubical iron block of side L and density $\rho \approx 8g\ \ cm^{-3}$. Even polished steel is inhomogeneous at the surface and the inter- atomic repulsion at the points of contact per atom is about ϵ/a_0 where $\epsilon \approx 10eV$ is the atomic binding energy and $a_0 \approx 10^{-8}$ cm is the atomic size. If N atoms are in actual contact, supporting the weight of the block (so that it does not fall through the floor!) then $N(\epsilon/a_0) \approx \rho L^3 g$. The actual area of contact is, therefore, $A_{actual} \approx N a_0^2$ and the ratio of A_{actual} to the macroscopic area L^2 is $A_{actual}/L^2 \approx \rho g L/(\epsilon/a_0^3)$. This is the ratio between the pressure of steel of height L to the 'atomic' pressure ϵ/a_0^3 and is a tiny quantity. Simple calulation shows that, even for a large block of $L = 1$ m, this ratio is about 10^{-7}. This is why frictional force does not scale in proportion with macroscopic area in normal (not specially polished) solids.

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L.B.S. P.G. College, Gonda; Asoke Sen, Assam University, Silchar; Sandeep Sahijpal, Punjab University, Chandigarh; Ashish Mahabal, Caltech, USA; Udit Narain, Meerut College; Madhavan Varadarajan, RRI, Bangalore; Jishnu Dey, Presidency College, Kolkata; Mira Dey, Presidency College, Kolkata; John Hearnshaw, New Zealand; Nagendra Kumar, K.G.K. (P.G.) College, Moradabad; Y. Tanaka, Japan; Alain Omont, IAP, France; Tagoshi H, Osaka University, Japan; Rollinde Emmanuel, France; N. Mittal, Meerut College, Meerut; Ue Li Pen, CITA, Toronto; Rob Crittenden, University of Portsmouth.

February

C.D. Ravikumar, France; Uma Vijh, STSCI, USA; H. Francois, France; K.P. Harikrishnan, The Cochin College, Kochi; K. Sivanandan, USA; P.P.Divakaran, IMSc, Chennai; Jeromo Guilet, France; Bhola Ishwar, Muzzafarpur; B.S. Khushvah, B.R.A. Bihar University, Muzzafarpur; L. Dharendra, Manipur University; R.G. Vishwakarma, Mexico; Jishnu Dey, Presidency College; Mira Dey, Presidency College; Naseer Iqbal Bhat, University of Kashmir.

March

Geoffrey Burbidge, University of California, California; Subenoy Chakraborty, Jadavpur University, Kolkata.

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

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