आईआईए न्यूज़लेटर

IIA Newsletter

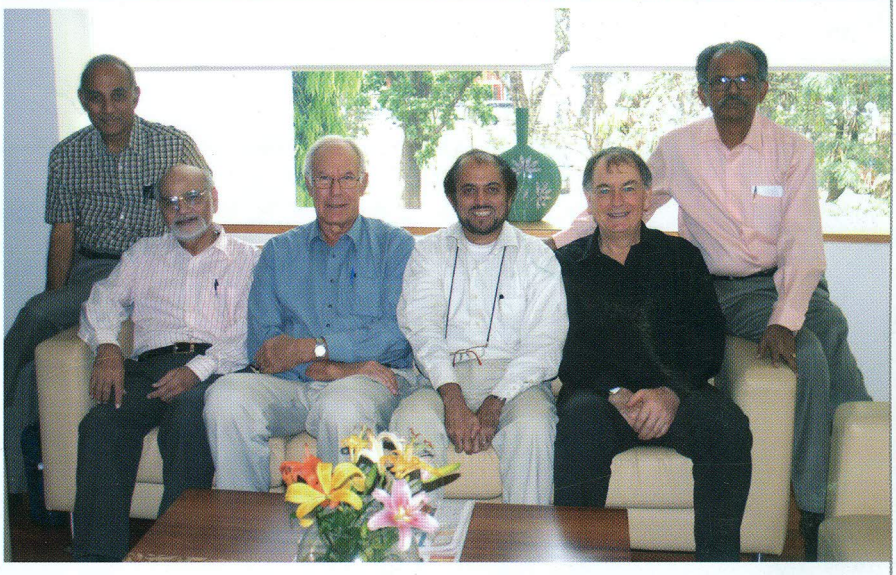
खण्ड 15 सं 2
Volume 15 No. 2

भारतीय ताराभौतिकी संस्थान
Indian Institute of Astrophysics

जून 2010
June 2010

In this issue...

Visit of the Science Advisory Committee



भाताभौ के निदेशक सहित वैज्ञान सलाहकार समिति सदस्य : (बायें से दायें) एस.अनंतकृष्णन, एन.कुमार, एन.वाइस, एस.एस.हसन (निदेशक, भाताभौ), एम.डोपिटा और जी.जोसेफ़

Members of the Science Advisory Committee along with the director of IIA: (L-R) S. Ananthakrishnan, N. Kumar, N. Weiss, S.S. Hasan (Director, IIA), M. Dopita and G. Joseph.

The Science Advisory Committee (SAC) of the IIA visited the Institute during 15-19 March, 2010. The committee, chaired by Professor Nigel Weiss (Cambridge), has Professors S. Ananthakrishnan (Pune University), Michael Dopita (Australian National University), George Joseph (Indian Space Research Organisation), N. Kumar (Raman Research Institute) and Dimitar Sasselov (Harvard-Smithsonian Center for Astrophysics) as members.

The SAC held its meeting in several sessions at the Institute's Bangalore campus, where they were briefed by the Director and given comprehensive reports on the academic and technical activities of the Institute. It met groups associated with various research programmes, observational facilities and projects. A number of scientists made presentations to the SAC and others held discussions with its members. The SAC also interacted with students and postdoctoral fellows. The SAC visited the various laboratories at Bangalore, CREST - Hosakote and VBO - Kavalur. The SAC also met with members of the administrative staff.

The Committee was very appreciative of the wide range of academic, developmental and training programmes being carried out at I I A. The SAC members made several important suggestions during the meeting sessions and the SAC is expected to submit a formal report soon.

-H.C.Bhatt

वैज्ञानिक सलाहकार समिति का आगमन

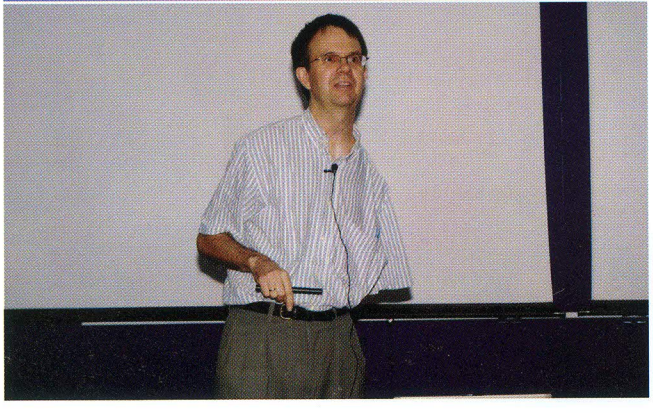
भारतीय ताराभौतिकी संस्थान की वैज्ञानिक सलाहकार समिति का 15-19 मार्च, 2010 के दौरान संस्थान में आगमन हुआ। प्रोफ़ेसर नाइजेल वाइस (कैम्ब्रिज) की अध्यक्षता वाली इस समिति में सदस्य हैं प्रोफ़ेसर एस.अनन्तकृष्णन् (पुणे विश्वविद्यालय), माइकल डोपिटा (आस्ट्रेलियन नेशनल यूनिवर्सिटी), जॉर्ज जोसेफ़ (भारतीय अंतरिक्ष अनुसंधान संगठन) तथा दिमितर सासेलोव (हारवर्ड – स्मिथसोनियन सेण्टर फ़ॉर एस्ट्रोफ़ीज़िक्स)।

अनेक सत्रों में समिति ने अपनी गोष्टी संस्थान के बेंगलूर परिसर में संपन्न की जिसमें उन्हें निदेशक महोदय ने संस्थान की गतिविधियों से अवगत कराया तथा उनके समक्ष वैज्ञानिक एवं तक्नीकी सक्रियताओं पर समाविष्ट प्रतिवेदन प्रस्तुत किये गये। समिति ने विभिन्न शोध कार्यक्रमों, प्रेक्षण सुविधाओं तथा प्रायोजनाओं से जुड़े वैज्ञानिक वर्ग से मुलाकात की। कुछ वैज्ञानिकों ने समिति के सामने प्रस्तुतिकरण दिये तो कुछ अन्य ने उनके साथ वार्तालाप किया। समिति ने शोध छात्रों व पोस्ट-डॉक्टरल फ़ेलो से भी वार्तालाप किया। समिति ने बेंगलूर, क्रैस्ट, होसकोटे तथा वेणु बापू वेधशाला, कावलूर की अनेक प्रयोगशालाओं का भी निरीक्षण किया।

वैज्ञानिक सलाहकार समिति ने संस्थान में विस्तृत रूप में चलाये जा रहे वैज्ञानिक, विकासात्मक तथा प्रशिक्षण कार्यक्रमों की सराहना की। गोष्ठी के सत्रों के दौरान समिति ने अनेक महत्वपूर्ण सुझाव दिये। समिति द्वारा शीघ्र ही अपना औपचारिक प्रतिवेदन दिये जाने की आशा है।

अनुवाद : आर.सी. कपूर

Lecture by Eric Cornell, Nobel Laureate



Professor Eric Cornell from JILA, NIST and the University of Colorado, Boulder, USA gave a popular talk at IIA, Bangalore on his Nobel Prize winning work on Bose-Einstein condensation (BEC) on 08 March 2010. The title of his talk was ***Stone Cold Science: Bose-Einstein Condensation and the Weird World of Physics a Few Millionth of a Degree Above Absolute Zero.*** He emphasised the connection between the famous wave-particle duality of quantum mechanics and BEC. By considering atoms both as particles and waves, he pointed out that as a cloud of atoms is cooled, its wave-like character dominates and a stage is reached when the individual waves overlap, thereby forming a giant matter wave which corresponds to BEC. The groundwork for the phenomenon of BEC was laid by the Indian physicist Satyendra Nath Bose and was predicted by Albert Einstein in 1925, but it took 70 years for it to be observed unambiguously by Cornell and Wieman at JILA and independently by Ketterle at MIT. All three of them shared the Nobel Prize for physics in 2001. Professor Cornell explained why it took so long for this phenomenon to be observed in the laboratory. He highlighted the fact that two very ingenious methods of cooling atoms-- laser cooling and evaporative cooling were used to realize BEC in a gas of dilute alkali atoms at temperatures in the nanokelvin range, and he described the novel techniques his group had to develop to measure such low temperatures. He briefly mentioned the friendly competition between his group and Ketterle's in the race to observing the first ever BEC.Professor Cornell spoke about the properties of BECs, particularly its coherence. His description of his group's work on the formation of quantized vortices in BECs and their relationship to superfluidity was very illuminating. He concluded his talk by bringing to the fore the important role of quantum mechanics not just in BEC but also in the emerging field of nanotechnology and other new technologies involving miniature devices.

- B. P. Das

Bicentennial Public Lecture

Professor Andre Beteille, Professor Emeritus, University of Delhi presented IIA's 20th Bicentennial Commemorative Public Lecture on April 16, 2010. Professor Beteille, a Padma Bhushan recipient and a prolific lecturer and writer, presented a talk entitled: ***Can Rights Undermine Trust? How Institutions Work and Why they Fail.***

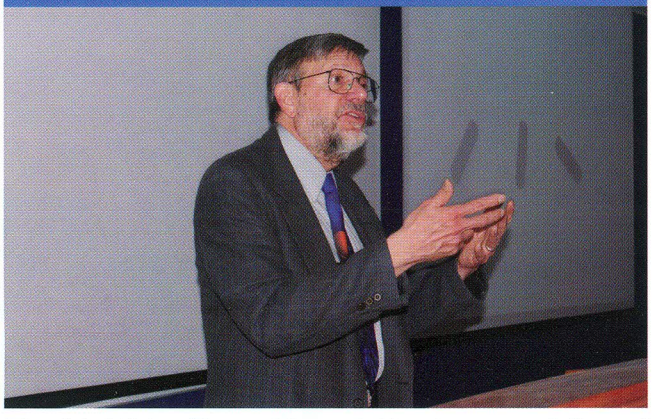
In his talk, Professor Beteille argued that social rights and trust are but two sides of the same coin for the well-being of collective life. He went on to compare domestic institutions such as family and institutions of science and scholarship. Although widely differing in their scope and scale within society, these two institutions work best when the rights of the consituent members and the function that

these institutions provide are based on the mutual trust vested in the members by the society (for the functioning of the institution) and the trust that the members have with society in protecting their rights.

The IIA Bicentennial Commemorative Public Lectures began in 1987 marking 200 years of astronomical observations from IIA.

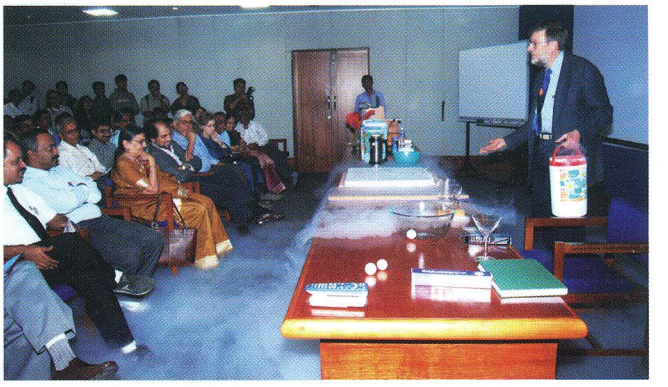
- B.R. Prasad

Vainu Bappu Memorial Lecture



The third Vainu Bappu Memorial Lecture was delivered by William D. Phillips, Nobel Laureate,on the 25th of January, 2010. Following a high tea in the west lawns of the Institute, the evening saw a large number of students from local schools and colleges, scientists and the general public joining the scientists and staff of the Institute to listen to the Nobel Laureate speaking on ***Time, Einstein, and the Coolest Stuff in the Universe.***

Professor Phillips started off with a historic account of the human endeavour of timekeeping and how it acquired a new meaning and perception from the ideas of Albert Einstein at the beginning of the 20th century. He explained how the scientific and technological developments since then have driven it to very high accuracies resulting in atomic clocks, the best timekeepers ever made.Such super-accurate clocks are essential to industry, commerce, and science; they are the heart of the satellite navigation system that guides cars, airplanes, and hikers to their destinations. Professor Phillips then showed how Einstein's predictions, that used ideas from the Indian physicist Satyendra Nath Bose on a new state of matter - a new kind of gas called a "Bose-Einstein Condensate (BEC)", are being exploited to improve the accuracy of atomic clocks. BEC's occur when the atomic gas is so cold that a large fraction of the atoms essentially stops moving. Further deliberations took Professor Phillips to using the long table on the speaker's podium as a mini laboratory to unfold a series of live demonstrations of the basic physics behind atomic and molecular motions, concepts of temperature, heat and cooling, and magnetic levitation, involving liquid nitrogen, air balloons and levitrons. Masterly control of these basic physical processes led to the revolutionary advances in the cooling



Professor Phillips and a section of the audience during one of his several live demonstrations of basic physics behind low temperature phenomena, with a liberal use of liquid nitrogen.

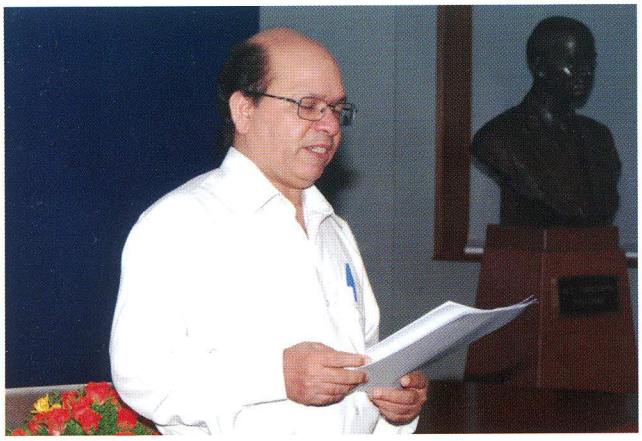
of neutral atoms to temperatures close to absolute Zero degree Kelvin by means of laser light, known as "laser cooling", by Professor Phillips in the early 1980's. The packed hall of audience remained spellbound to his inspiring and exciting lecture. The great enthusiasm and innate curiosity of the speaker left a clear impact on everyone present in the hall, and the end of the lecture saw the audience, especially the young students from schools and colleges, flocking the podium to interact with the Nobel Laureate.

Professor Phillips is a Fellow of the National Institute of Standards and Technology in Gaithersburg MD, USA, where he leads the Laser Cooling and Trapping Group in the Atomic Physics Division of NIST's Physics Laboratory. He is also Distingushed University Professor, University of Maryland, College Park, Maryland.Apart from the Nobel Prize in Physics in 1997, Professor Phillips has received numerous awards and honours, the most notable ones among them are: elected to the US National Academy of Sciences 1997, Arthur L. Schawlow Prize in Laser Science (APS) 1998, American Academy of Achievement Award 1999, Gold Medal of the Pennsylvania Society 1999,Service to America Medal, Career Achievement Award 2006, Meritorious Senior Professional Award (Presidential Rank) 2005, Trotter Prize 2006, and Doctorado Honoris Causa, Universidad Autónoma de San Luis Potosí, San Luis Potosí, Mexico, 2009. He has been a Fellow of the American Physical Society, the Optical Society of America, the American Academy of Arts and Sciences and a member of the National Academy of Sciences, the Sigma Xi Research Society, and the Society of Physics Students.

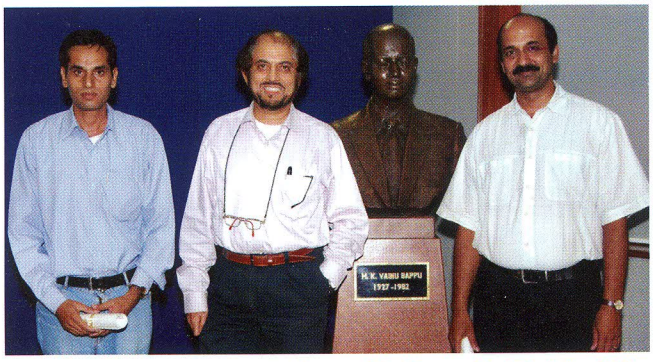
- S.P. Rajaguru

In-House Scientific Meeting, 2010

IIA In-House Scientific Meeting was held on 09 April 2010 for the purpose of discussing research and development within the institute. Different groups, solar, stellar, galactic and extragalatic astrophysics, instrumentation and theoretical physics reported new scientific results and provided status reports on the current projects and



The organisation of 2010 in-house science meeting was overseen by H.C. Bhatt, Dean (Academic).



The winners, P. Parihar (left) and R. Ramesh (Right), of the best paper awards with S.S. Hasan, the director.

facilities. In all, there were 22 oral and 8 poster presentations. Of the oral presentations, 8 were given by students. An important topic of the meeting was the presentation of preliminary results from the 2009 solar eclipse observations.

The following were the highlights of this meeting: *R.T. Gangadhara, P. S. Parihar and R. Ramesh* were presented *The Outstanding Research Paper* award for the year 2009 for their respective papers : *Circular Polarization in Pulsars due to Curvature Radiation,* by R. T. Gangadhara, 2010. ApJ, 710, 29; *Exploring Pre-Main-Sequence Variables of the ONC: the New Variables* by P. Parihar, S. Messina*, E. Distefano*,N. S. Shantikumar, B. J. Medhi, 2009, MNRAS 400, 603; *Radioheliograph Observations of Metric Type II Bursts and the Kinematics of Coronal Mass Ejections* by R. Ramesh, C. Kathiravan, S. S. Kartha and N. Gopalswamy, ApJ, 2010, 712, 188.

Accelerating Waves in Solar Polar Regions

Solar coronal holes are regions of cool and low density plasma that appear dark at coronal temperatures. Coronal hole regions contain predominantly unipolar magnetic field which is thought to give rise to the fast solar wind. MHD waves are important for the heating of solar corona and in acceleration of fast solar wind. Extreme-ultraviolet images of polar coronal holes reveal the presence of diffuse,

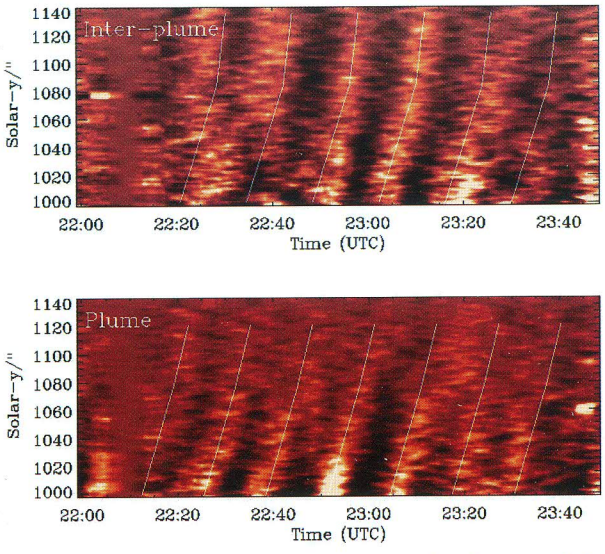


Fig.1.Enhanced space (solar Y)-time map of radiance variation.

spike-like or sheet-like structures which are called as plumes whereas regions between these structures are termed as inter-plumes. Some of the studies concluded that plumes have lower outflow speeds than inter-plume regions (Noci et al. 1997; Giordano et al. 2000; Patsourakos & Vial 2000; Teriaca et al. 2003; Raouafi et al. 2007) and, hence, may not contribute significantly to the fast solar wind, whereas some other theoretical and observational studies find higher outflow speeds in plumes than in inter-plume regions for at least some altitudes above the photosphere (Casalbuoni et al. 1999; Gabriel et al. 2003, 2005). These contradictory reports led to the debate on whether plumes or inter-plumes are the preferred source regions for the acceleration of the fast solar wind.

The authors obtained the time series data on 13 November 2007 as JOP196/HOP045 programme with EIS/Hinode and SUMER/SoHO spectrometer in north polar coronal hole region. From distance-time radiance maps they detect the presence of propagating waves in the inter-plume region with a period of 15 min to 20 min where propagation speed increases from 130 km/s just above the limb, to 330 km/s around 160 arcsec above the limb. These waves can be traced to originate from a bright region of the on-disk part of the coronal hole where the propagation speed is in the range of 25 km/s to 38 km/s, with the same periodicity. The adjacent plume region also shows the presence of propagating disturbance with the same range of periodicity but with propagation speeds in the range of 135 km/s to 165 km/s only. A comparison between the distance-time radiance map of both regions (see Fig. 1), indicate that the waves within the plumes are not observable (may be getting dissipated) far off-limb whereas this is not the case in the inter-plume region. The authors have also studied the propagation properties using time-delay methods (see Fig.2).

The propagation speed becomes supersonic (> Cs 150 km/s for 1 MK corona) far off-limb in the inter-plume

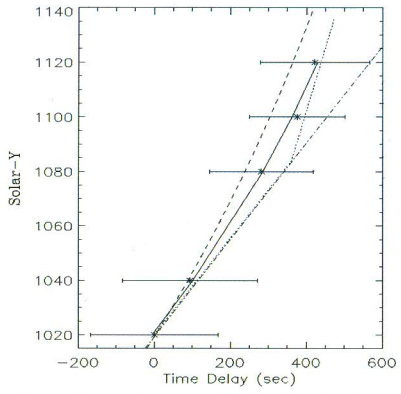


Fig.2. Variation of travel time with height in inter-plume region. The asterisks represent the measured time delays while the continuous line corresponds to a second order polynomial fit applied to the data points. The dotted line corresponds to the fit to the slanted radiance ridges in the x-t maps (white lines of top panel of Figure 1). The dashed and the dot-dashed lines are the theoretically predicted Alfvenic time delays obtained assuming a magnetic field constant with height and expanding according to Kopp & Holzer (1976), respectively.

region. Moreover, near the limb region, these propagating disturbances are temperature independent. This, together with the presence of oscillations in Doppler width and line shift, may suggest that these waves are Alfvenic in nature. Conversely, the measured propagation speeds are also consistent with the fast magnetoacoustic mode of propagation within the error bars of the propagation speeds and explains the observed radiance oscillations due to its compressible nature. Hence, interpretation of these propagating disturbances in terms of fast magnetoacoustic waves also appears reasonable. To our knowledge, this is the first time that a signature of accelerating Alfvenic waves or fast magnetoacoustic waves originating in an on-disk bright region has been observed within 1.2 solar radii. These results also support the view that the inter-plume regions are the preferred channel for the acceleration of the fast solar wind. *These results have been accepted for publication in Astophysical journal (Gupta et al. 2010; http://arxiv.org/abs/1005.3453).*

References:

Casalbuoni, S. et al. 1999, JGR, 104, 9
Gabriel, A. H. et al. 2003, ApJ, 589, 623
Gabriel, A. H. et al. 2005, ApJ, 635, L185
Giordano, S. et al. 2000, ApJ, 531, L79
Gupta, G. R. et al. 2010, arXiv:1005.3453v1
Kopp, R. A., & Holzer, T. E. 1976, SP, 49, 43
Noci, G., et al. 1997, AdSR, 20, 2219
Patsourakos, S., & Vial, J.-C. 2000, A&A, 359, L1
Raouafi, N. et al. 2007, ApJ, 658, 643
Teriaca, L. et al. 2003, ApJ, 588, 566

- Girjesh R. Gupta & D. Banerjee

Stability of a Bow-Shock

In a sequel of 3 papers the authors have argued in favour of turbulent fragmentation of spatially extensive gas slabs as the possible progenitors of elongated molecular clouds (MCs). It has been shown that dense structure so formed could explain the physical conditions observed in real star-forming clouds. In an earlier article in this newsletter, ``*Formation of filaments and prestellar cores*", December 2009, the authors have reported findings from our SPH based numerical simulations of confined, planar gas-slabs. The ambit of that investigation has since been widened to include physically dissimilar clouds.

A head-on collision between two such clouds, results in a bow-shock driven by the smaller of the two clouds, into the larger one. The stability of this bow-shock has been the point of investigation of recent work. The bow-shock, like the planar shock-confined slab resulting from a highly supersonic head-on collision between identical clouds, is also confined by shocks. Also, its evolution shows a remarkable similarity to the latter. Thus, the bow-shock, like the planar shock was also found to be unstable to numerous hydrodynamical instabilities, and in particular to the thin shell instability (TSI). The TSI is characterised by the appearance of wiggles on the surface of the shock-front, which, for the sake of brevity, may be considered similar to the bending modes.

The TSI is instrumental in transferring momentum in the perturbed regions of the shell, which in turn leads to dissipation of kinetic energy due to viscous interaction between fluid elements. Consequently, the confined shell, in resemblance with the planar shocked-slab becomes self-gravitating and collapses laterally to produce a filament aligned with the collision axis. Starting from relatively quiescent initial conditions, turbulence generated via purely hydrodynamical phenomena within layers of gas, is a distinct advantage of this model, and other similar models. These latter envisage an energetic collision between massive gas streams, or impact of shock waves on molecular clouds (MCs). The success of these models in reproducing certain features observed in star-forming regions has shown that shocks in the ISM play a crucial role in regulating the star-formation cycle and ultimately, evolution of the galaxy itself. Filamentary globules, when first catalogued by Schneider & Elmegreen (1979), were thought to be obscure remnants within larger MCs, however, detailed maps of such regions at sub-mm wavelengths in the recent past have revealed their interiors. Prestellar cores often appear embedded in filamentary regions.

Any theory attempting to explain the formation of stars must be able to reconcile the observed distribution of core, and stellar masses. A suitable explanation for the formation of prestellar cores, and the distribution of their masses is therefore crucial to the success of a theory of star-formation. The question ultimately reduces to explaining the processes responsible for assembling the

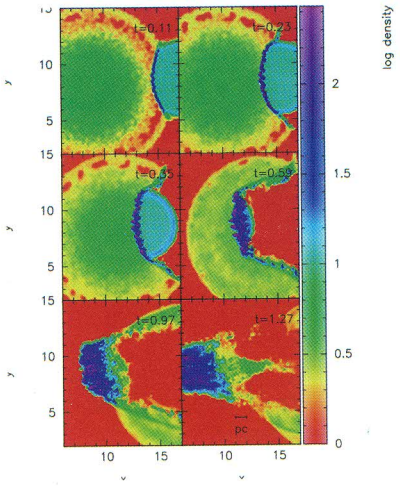


Fig. 1. A scroll showing cross-sectional column density plots of the colliding clouds. The bow-shock driven by the smaller cloud does not have a smooth surface, but shows a number of wiggles.

material in which cores may eventually form; a corollary to which is the timescale over which the process takes place. Another advantage of the model tested by the authors is in its ability to explain structure formation on a timescale comparable to a crossing time, which is consistent with the reported ages of young star-forming regions.

An interesting aspect of the filamentary mode of star-formation is the transfer of angular momentum along the filament, and gained by the core during its accretion phase, that could be crucial to the dynamical evolution of the latter. For a self-gravitating core located in a filamentary cloud, the disc circumscribing a young stellar object (YSO), at the centre of the core is likely to be aligned with the direction of angular momentum for the filament. Combining this hypothesis with the premise that an outflow is generally launched along the axis of the prestellar core with a small opening angle, leads us to conclude that an outflow may be expected to be orthogonal to its natal filament. In one of the earlier works (Anathpindika & Whitworth 2008), the authors have surveyed 5 filamentary star-forming regions and observed that outflows in general tend to be orthogonal to their natal filaments. It will be one of their future endeavours to investigate the physical reasons for such an occurrence, the magnetic field perchance could have a vital role to play. The effect of this geometry on the fragmentation of the circumstellar disc is another question that demands consideration. *This work has been published in the MNRAS, 2010, 514tmp*

References :

Anathpindika, S., & Whitworth, A., 2008, A & A,487, 605
Schneider, S., & Elmegreen, B., 1978, ApJS, 41, 87

- S. Anathpindika

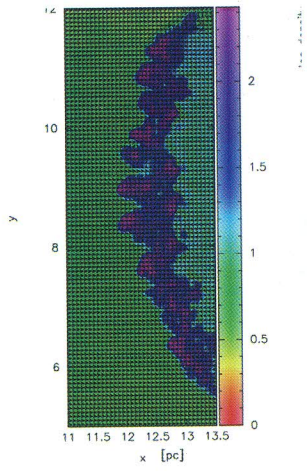


Fig. 2. A column density plot with the local velocity field shows a much closer view of the dynamically unstable bow-shock.

UVIT-EM Telescope Integration

Ultraviolet Imaging Telescope (UVIT) consists of two similar telescopes: one for near UV and visible, and the other for far UV.

Integration, optical alignment and testing of the engineering model (EM) of near UV telescope has been carried out during the last month in Class 100 clean area of the Prof M.G.K Menon Laboratory (MGKML), at the Hosakote campus. Some of the highlights are briefly presented here.

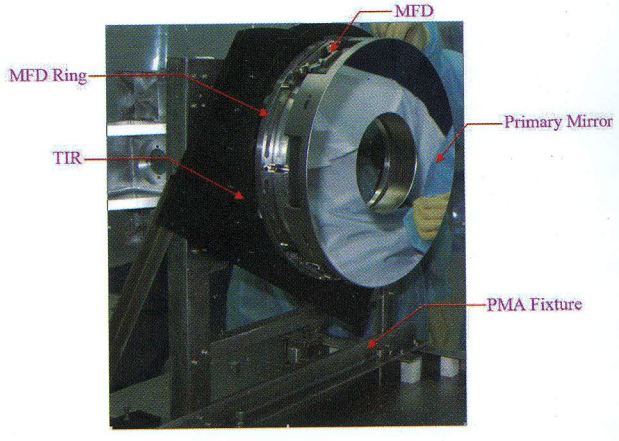


Fig.1. Primary mirror assembly is shown mounted on telescope ring.

Primary Mirror Assembly (PMA) consisting of Primary mirror with its mount of invar-ring (supplied by LEOS, ISRO) is mounted on Telescope ring as shown in Fig. 1. As any small mismatch in the mechanical mounting surfaces can stress the mirror, this mounting is done with great care:

Before mounting, surface figure of the mirror is tested with Interferometer in free condition, and the same is done after mounting. It is found that no significant change occurred in figure of the mirror, showing that no significant deformation of the surface occurred during mounting.

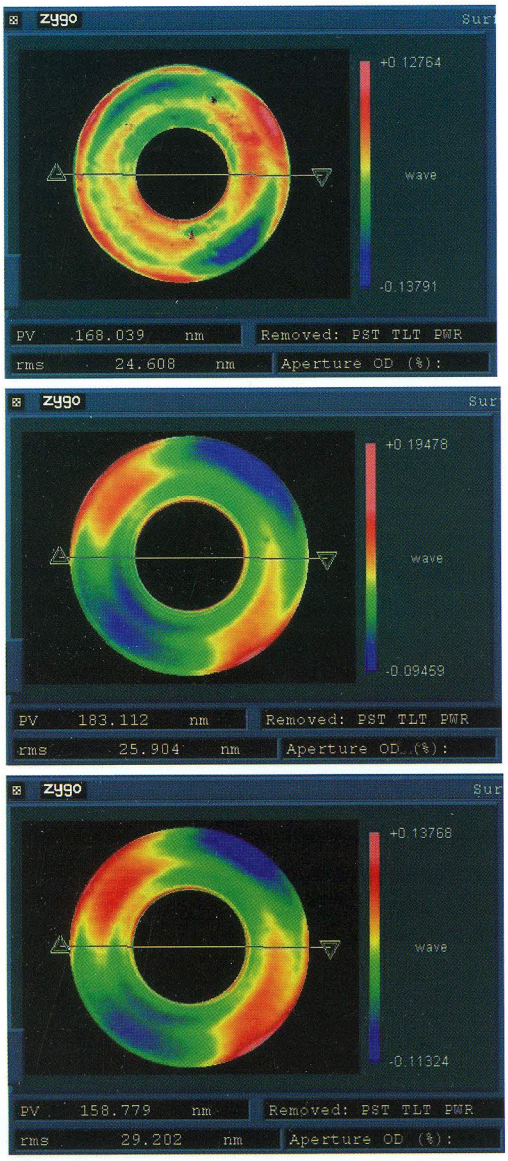


Fig. 2. Surface of primary mirror at different levels of tightening. a) bolts torqued to ~2Nm. b) bolts torqued to 8.75Nm. c) bolts torqued to 12.5Nm.

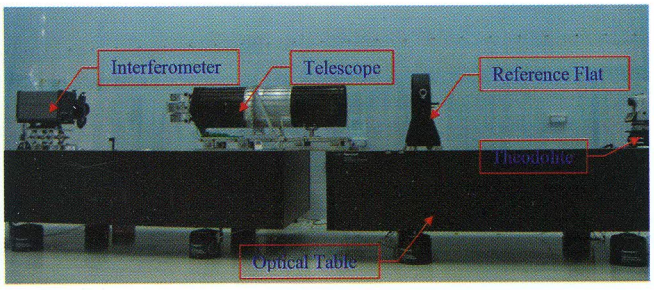


Fig.3. Interferometric setup for aligning/testing integrated UVIT unit telescope in class 100.

Table 1 : Torquing level of PMA at MFD Ring / TIR interface and surface figure measured in terms of RMS and PTV are tabulated.

Torque Level	RMS	PTV
Free Condition (~ 20%- 2Nm)	λ/25.7	λ/3.8
70% (8.75 Nm)	λ/24.4	λ/3.5
100% (12.5 Nm)	λ/21.6	λ /3.9

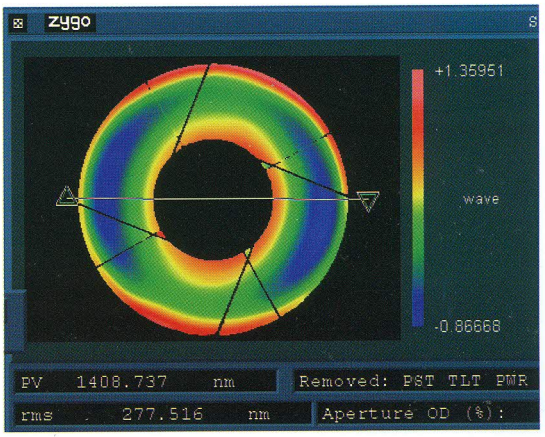


Fig. 4. Interferometric test result of EM UVIT telescope (Spherical primary and secondary mirror) during the alignment in class 100. The leftover coma is ~20nm.

The surface maps are shown in Fig. 2 and data on surface figures are shown in Table 1. Primary mirror assembly was mounted on telescope Tube end and the optical axis was found with theodolite and alignment telescope. The interferometer was aligned to the optical axis behind the primary mirror. The tilt and decentricity of the detector mounting bracket, in the focal plane, with respect to the optical axis was corrected. Secondary mirror module was now assembled and mounted on the other end of the telescope tube.

The alignment error (tilt and decentricity) of the secondary mirror was first found with theodolite and corrected with the help of shimming at the secondary mirror/mechanical interface. Final correction of secondary was carried out with the help of interferometer, see Fig. 3 for the set up. Interferogram of the aligned telescope is shown in Fig. 4.

After populating with the engineering model detector and the filter-wheel, this telescope would be ready for assembling on the Titanium cone adaptor -- which interfaces UVIT with the satellite. A mass model (without any optics in it) of the far UV telescope, too would be mounted on the Titanium cone adaptor to get the engineering model assembly ready for vibration tests.

- UVIT Team

Gauribidanur Radioheliograph (GRH) Expansion

The existing GRH array and its receiver system are being modified since the middle of 2008 to probe the solar corona with higher angular resolution and better sensitivity in the frequency range 40 - 150 MHz. The expansion is being carried out in two phases - the maximum baseline length in Phase I will be 3 km (as compared to the existing 1.3 km); in Phase II, it is proposed to extend the same to 10 km.

The first light, with the Phase I of the expansion, was obtained by correlating the signal from the extreme two antenna groups (interferometer mode) in the east-west arm of the expanded array. The baseline separation between the two antenna groups is about 3 km. The observations were on 3C405 (a calibrator source for the GRH) in the meridian transit mode. The observing frequency was 80 MHz. The integration time used was 256 ms. The observations were carried out with a prototype single channel receiver. The development of a 64 channel analog receiver (corresponding to the 64 antena groups in the expanded array) and a 4096 channel digital correlator receiver required to make two-dimensional images with the Phase I of the expanded GRH are underway.

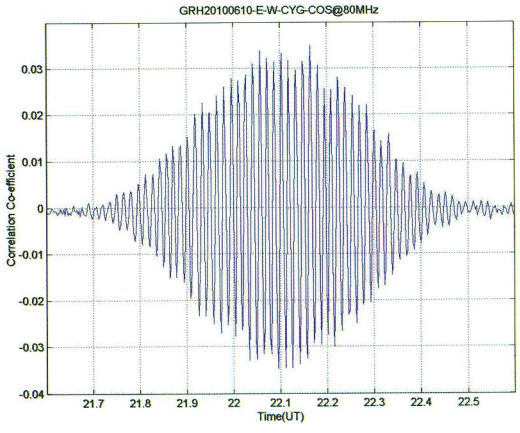


Fig.1. Interference fringes obtained on Cygnus-A.

- Radio Astronomy Group

Summer School in Physics & Astrophysics

The *Summer School in Physics and Astrophysics* had a total of 25 participants. Out of these, 14 students were selected for the school and 11 students for the summer internship programme at IIA, Bangalore.The participants were welcomed by K. Sundara Raman, Scientist-in-charge, Kodaikanal Observatory.

Twelve scientists of the institute delivered lectures on a wide range of topics in Astronomy and Astrophysics. The inaugural lecture was delivered by S. P. Bagare who presented an overview of the ongoing academic activities of the institute, upcoming large astronomical projects in India and the enormous opportunities available for the younger generations. He also gave lectures on general solar physics, available instrumentation to study the upcoming large ground-based and space-based facilities in the country for the study of the Sun. U. S. Kamath introduced the concepts of the coordinate systems in positional astronomy, telescopes, detectors and measurements in astronomy. T. Sivarani gave lectures on star formation and stellar nucleo-synthesis. In addition she also demonstrated spectroscopic data reduction techniques in optical astronomy. K. Sundara Raman gave lectures on the transient activities of the Sun, their impact on space weather and the instruments available at the Kodaikanal Observatory to study the solar phenomena.

The properties and nature of the dust in the Universe were discussed by C. Muthumariappan.F. Sutaria described the physics of stellar structure and evolution. Lectures on galactic astronomy were delivered by A. Subramaniam. C. S. Stalin spoke on Extragalactic astronomy. He also delivered a talk on the basics of photometric data reductions and helped the participants to have hands on experience. Lectures on brown dwarfs and extra-solar planets were given by S. Sengupta. The participants were introduced to X-ray and gamma-ray astronomy by P. R. Vishwanath. He also talked about various activities taken by the Institute to study gamma-rays from astronomical sources. During the school two special evening lectures were also arranged. One titled "Is there a final theory?" and the other "Recent discoveries in Neutrino Physics" were delivered by G. Rajasekaran of the Institute of Mathematical Sciences, Chennai. He also gave an overview of the upcoming Indian Neutrino Observatory (INO). Lectures on relativistic astrophysics were given by A. Mangalam. An introductory lecture on Radio astronomy techniques was delivered by R. Ramesh. He also gave a lecture on the different solar phenomena that can be studied at radio frequencies. A. Satyanarayanan gave lectures on Magneto-hydro dynamics.

The school was co-ordinated by C. S. Stalin and the local arrangements were carried out efficiently by the staff members of the Kodaikanal Observatory under the guidance of K. Sundara Raman.

- C. S. Stalin

16th National Space Science Symposium

The 16th National Space Science Symposium (NSSS 2010) was held at Saurashtra University, Rajkot during 24 - 27 February 2010. The symposium was sponsored by ISRO, in association with the Astronomical Society of India. It was organised to provide a scientific forum for the presentation of new results and to discuss recent developments in space science, planetary exploration and space- and ground-based astronomy programmes/projects being pursued at various research institutions and universities in India. From IIA, D. Banerjee gave an oral presentation on *Solar Physics from Small Satellites*, A. C. Pradhan gave both poster and oral presentations on *Study of far ultraviolet Diffuse Emission from the Large Magellanic Cloud* (Co-authers: A. Pathak and J. Murthy) and R. B.Singh presented a poster on *Aerosol loading over high altitude colddesert site at Hanle in the western Himalaya as retrieved from sky Radiometer*•(Co-authers: N. Sihna, S.P. Bagare, N. S.Singh) in that symposium. A.Satyanarayanan and R.C.Kapoor from IIA were also participated in the symposium. The poster of A. C. Pradhan et al. won the best poster presentation award and was handed a cash prize of ten thousand rupees along with a certificate of proof.

- A. C. Pradhan

IIA Research Publications

March - May 2010†

(1) Subramaniam, A., *Carraro, G., *Janes, K. A., MNRAS, 404, 1385, *Optical photometry and basic parameters of 10 unstudied open clusters*

(2) Goswami, A., *Aoki, W., 2010, MNRAS, 404, 253, *HD209621: abundances of neutron-capture elements*

(3)*Vani, V. C., Chatterjee, S., Physica Scripta, 81, p.55402-1, *Detection of a periodic structure hidden in random background: the role of signal amplitude in the matched filter detection method*

(4) *Chattopadhyay, S., Chaudhuri, R. K., *Mahapatra, U. S., CPL, 491,102, *Studies on m-benzyne and phenol via improved virtual orbital-complete active space configuration interaction(IVO-CASCI) analytical gradient method*

(5) *Garcia-Hernandez, D. A., *Lambert, D. L., Rao, N. K., *Hinkle, K. H, *Eriksson, K, 2010, ApJ 714,144 , *Oxygen isotopic ratios in cool R Coronae Borealis stars*

(6) *Samal, M. R, *Pandey, A. K, *Ojha, D. K, *Ghosh, S. K, *Kulkarni, V. K, *Kusakabe, N, *Tamura, M, Bhatt, B. C, *Thompson, M. A, *Sagar, R., 2010, ApJ, 714, 1015, *A multiwavelength study of star formation in the vicinity of galactic H II region Sh2-100*

(7)*Bedding, T. R,* Huber, D., *Stello, D., *Elsworth, Y. P, *Hekker, S., *Kallinger, T.,Mathur, S., & 42 coauthors., 2010, ApJ,713, L176 *Solar-like oscillations in low-luminosity red giants: first results from Kepler.*

(8) *Messina, S., Parihar, P., *Koo, J. R., Kim, S. L, Rey, S. C, Lee, C. U., 2010,A&A, 513, No. A29, *RACE-OC project: rotation and variability in the open cluster M 11 (NGC 6705)*

(9)*Stello, D., *Basu, S., *Bruntt, H., *Mosser, B., *Stevens, I. R., *Brown, T. M, *Christensen-Dalsgaard, J., *Gilliland, R. L., *Kjeldsen, H.,* Arentoft, T., *Ballot, J.,* Barban, C, *Bedding, T. R., *Chaplin, W. J., *Elsworth, Y. P, *Garcia, R. A.,*Goupil, M. J, *Hekker, S, *Huber, D, Mathur, S., and 18 coauthors., 2010, ApJ, 713, L182 , *Detection of solar-like oscillations from Kepler photometry of the open cluster NGC 6819*

(10) Ramesh, K. B, 2010, ApJ Lett., 712, L77, *Coronal Mass ejections and sunspots- Solar cycle perspective*

(11) Ramesh, R, Kathiravan, C, Kartha, S. S, Gopalswamy, N., 2010, ApJ, Vol. 712, 188, *Radioheliograph observations of metric Type II bursts and the kinematics of coronal mass ejections*

(12) *Mahapatra, U. S., *Chattopadhyay, S, Chaudhuri, R. K, 2010, J. Phys. Chem. A, Vol. 114,3668, *Second-order state-specific multireference moller-plesset perturbation theory (SS-MRMPPT) applied to geometry optimization*

(13)* Kumar, B., Mathur, S., *Garcia, R. A., Venkatakrishnan, P., 2010, ApJ, 711, L12, *On the flare induced high-frequency global waves in the sun*

(14) *Chattopadhyay, S., *Mahapatra, U. S, Chaudhuri, R. K, 2010, Chem. Phys. Lett., Vol. 488, 229, *Study of equilibrium geometries of diradicaloid systems via state specific multireference moller-plesset perturbation theory (SS-MRMPPT)*

(15) Ramesh, R, Kathiravan, C, *Sastry, Ch.V, 2010, ApJ,711, 1029, *Estimation of magnetic field in the solar coronal streamers through low frequencyradio observations*

(16) *Mahapatra, U. S, *Chattopadhyay, S, Chaudhuri, R. K, 2010, J.Chemi.Theory & Computation, 6, 662, *Study of the ground state dissociation of diatomic molecular systems using state-specific multireference perturbation theory: a Brillouin-Wigner scheme.*

(17) *Aviles, A.,* Zharikov, S., *Tovmassian, G., *Michel, R., *Tapia, M., *Roth, M., *Neustroev, V., *Zurita, C., *Andreev, M., *Sergeev, A., *Pavlenko, E, *Tsymbal,V., Anupama, G. C, Kamath, U. S, Sahu, D. K, 2010, ApJ, 711, 389, *SDSS J123813.73-033933.0: a cataclysmic variable evolved beyond the period minimum*

(18) Suryanarayana, G. S, 2010, New Astronomy, 15, No. 3, 313 *High abnormal rotation rates of sunspots and flare productivity*

(19)Raju, K. P., 2010, Solar Phys., 262, 61, *Intensity distribution and contrast of the solar EUV network*

(20)*Placco, V. M., *Kennedy, C. R., *Rossi, S., *Beers, T. C, *Lee, Y. S, *Christlieb, N, Sivarani, T, *Reimers, D, *Wisotzki, L., 2010,

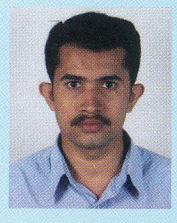
ApJ,139,1051, *A search for unrecognized carbon-enhanced metal-poor stars in the galaxy*
(21) Muthumariappan, C., 2010, A&A, 31, 17,*Three-component dust models for interstellar extinction.*
(22) *Jade, S., Raghavendra Rao, H. J., *Vijayan, M. S. M, Gaur, V. K, Bhatt, B. C, *Kumar, K, *Jaganathan, S.,* Ananda, M. B, *Dileep Kumar, P., 2010, *GPS-derived deformation rates in northwestern Himalaya and Ladakh*
(23) Mathew, B, Subramaniam, A, Bhavya, B, 2010, BASI, 38, 35, *Spectroscopic study of a few Herbig Ae/Be stars in young open clusters*
(24) Giridhar, S, *Molina, R., *Arellano Ferro, A, Selvakumar, G., 2010, MNRAS in press,*Chemical composition of A-F type post-AGB candidates*
(25) Giridhar,S., 2010,BASI, 38,1, *Advances in spectral classification*

† *From IIA Repository*

Ph.D Thesis Submissions

B. Mathew submitted his Ph.D thesis titled ***Study of emission line stars in young open clusters*** to the University of Calicut, Kerala on 20 January 2010. His thesis supervisor was A. Subramaniam.

Abstract: Emission-line stars in young open clusters are identified to studytheir properties, as a function of age, spectral type and evolutionary state. 207 open star clusters were observed using slitless spectroscopy and 157emission stars were identified in 42 clusters. We found 54 Be stars in24 open clusters for the first time. We suggest bimodal origin of Be stars inwhich B0 - B2 candidates spin up to Be phase while others are born as Be *stars.*



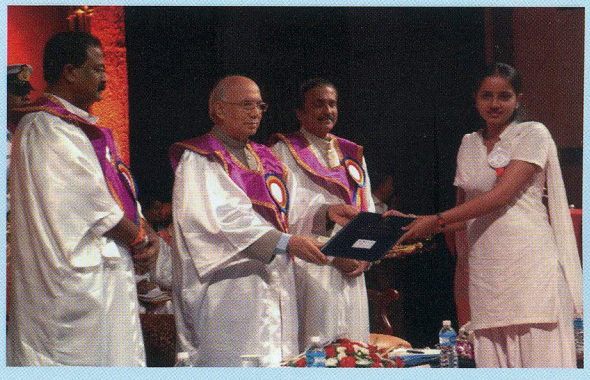
G. Vigeesh submitted his Ph.D thesis titled ***Structure, dynamics and heating in magnetized regions of solar atmosphere*** to the Mangalore University on 10 January 2010. His thesis supervisor was S.S. Hasan.

Abstarct. We carried out an investigation of MHD wave dynamics in magnetic network elements using numerical simulation in order to understand various properties of MHD waves and to estimate the energy transported by them. We find that the estimated acoustic energy flux generated by footpoint motions can hardly balance the chromospheric energy requirements in the network. We have also explored the feasibility of developing diagnostic tools for the helioseismic exploration of solar atmosphere using numerical simulations.

Awards

The paper *Gravity of ITS from BITS via Information, Holography and Vacuum Energy* by **C. Sivaram** got an Honourable Mention in the Competition of the Gravity Research foundation Massachusetts, USA, for the year 2010.

M. Sampoorna has received the ***Kumari L. A. Meera Memorial Medal*** for the year 2008-2009 given by the Council of the Indian Institute of Science (IISc) for the best Ph.D. thesis of the year in the Department of Physics at IISc. The title of her thesis is ***Polarized line formation in turbulent and scattering media***. The Award was given on 3rd March 2010.



H. N. Smitha receiving the awards from the Governor of Karnataka, during the convocation ceremony of Bangalore University

H.N. Smitha, presently a JRF at the Indian Institute of Astrophysics,received Seven Gold Medals at the convocation ceremony, held on 30 April 2010, of the Bangalore University. The medals and certificates are given to the candidate securing the highest marks in the University, also including the affiliated PG centers. She secured the University First Rank in M.Sc Physics for this year (2010) from the Bangalore University.

Chandrasekhar Post-Doctoral Fellowships

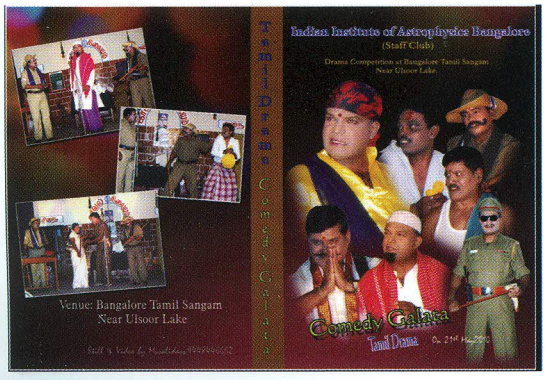
The Director, IIA invites applications from exceptionally bright candidates with outstanding academic credentials for the award of 'Chandrasekhar Post-Doctoral Fellowships' in all areas of astrophysics. Applications are accepted at any time of year. The fellowship is for an initial period of two years, extendable to three, with a minimum monthly stipend of Rs.25,000/-, an annual contingency grant of Rs.1,00,000/-, housing and medical benefits, and support for travel to Bangalore. More details are at http://www.iiap.res.in/postdoc.htm.

Former Supreme Court Justice Dr. Mohan giving the award to K. Sundara Raman in the presence of (left) Dr. S.Vincent, Member Secretary, Tamil Nadu State Council of Science and Technology.

K. Sundara Raman has been conferred with the ***Sir J. C. Bose Memorial*** Award by the ***Indian Science Monitor*** an NGO at Chennai and Tamil Nadu State Council of Science and Technology in recognition of his contribution to dissemination of space science, astrophysics and higher education. The award was given on the National Science Day, 28 February 2010. The award carried a citation and a medal.

Tamil Drama by IIA Staff Wins Awards

Members of IIA staff club staged a tamil drama *Comedy Galatta* at a drama competition organised by the BangaloreTamil Sangam, and won awards for the best drama.

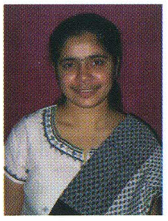


Pictures of scenes from the drama and of characters in it collected on the cover of a CD of the drama released by the Bangalore Tamil Sangam.

The IIA staff club members who acted in the drama with the trophies they won, with S.S. Hasan, director of IIA.

Welcome

IIA Welcomes...



... M. Sampoorna, who joined the Institute as Chandrasekhar Post Doctoral Fellow on 22 March 2010. Sampoorna works on the theory of polarized light scattering and radiation transfer in stellar atmospheres. She had worked earlier for her Ph.D. at IIA (April 2008). Before taking up her new position at IIA, Sampoorna was a Post-Doctoral Fellow at Instituto de Astrofisica de Canarias, Tenerife, Spain.

Farewell

IIA wishes all the best to...

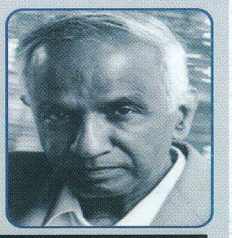
... Mr. P. Venkoba Rao joined the Vainu Bappu Observatory at Kavalur on 15 October 1986 and retired on 28 February 2010 on attaining the age of superannuation.

... Mr. V. Annamalai joined IIA, Bangalore on 01 July 1978 and retired as Laboratory Assistant B on 31 March 2010 on attaining the age of superannuation.

... Mr. N. Samudiappan joined the Vainu Bappu Observatory, Kavalur on 07 May 1980 and retired as a supporting staff at IIA, Bangalore on 31 May 2010 on attaining the age of superannuation.

... Mr. K. Mohan Kumar joined IIA, Bangalore on 15 September 1975 and held various positions in the Administrative division. He retired as Senior Assistant Administrative Officer on 31 May 2010 on attaining the age of superannuation.

Chandrasekhar Centenary Conference



7-11 December, 2010

Indian Institute of Astrophysics, Bangalore , INDIA

An international conference to commemorate the birth centenary of Professor S. Chandrasekhar will be held during December 7-11, 2010 at the Indian Institute of Astrophysics, Bangalore. The conference will focus on areas in which Chandrasekhar worked. Topics include: stellar structure and evolution, stellar dynamics, stellar and planetary atmospheres, astrophysical fluids and plasmas, compact objects and general relativity and black holes.

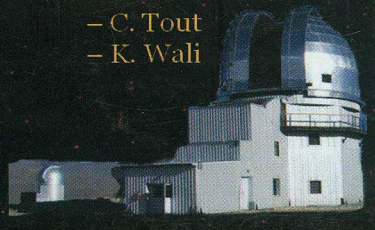
◆ **Persons interested in participating in the conference should send their request by August 1, 2010 to chandra@iiap.res.in**

◆ **More details will be available from the website: http://www.iiap.res.in/meet/chandra**

Confirmed Speakers

- H. M. Antia
- H. C. Bhatt
- D. Bhattacharya
- J. Binney
- R. Blandford
- A. Brandenburg
- A. R. Choudhury
- P. Eggleton
- J. Goodman
- B. Iyer
- B.C. Low
- D. Merritt
- T. Padmanabhan
- D. Sasselov
- S. Sengupta
- R. Sheth
- S. Sridhar
- A. Toomre
- R. Wald
- C. Tout
- K. Wali

The Conference is being organized by the Indian Institute of Astrophysics, Bangalore and is co-sponsored by the Indian National Science Academy, Indian Academy of Sciences, the National Academy of Sciences, Inter-University Centre for Astronomy and Astrophysics (Pune) and Tata Institute of Fundamental Research (Mumbai).



Local Organizing Committee

D. Banerjee, R. K. Banyal, C. Birdie, H. C. Bhatt, A. R. Choudhury, S. S. Hasan (Chair), B. Nath, G. Pandey, B. R. Prasad, R. Ramesh, P. Srikumar and F. Sutaria

Scientific Organizing Committee

N. M. Ashok, J. S. Bagla, J. N. Chengalur, S. S. Hasan, R. Kaul, D. Narasimha, T. Padmanabhan (Chair) and K. Subramaniam

Editors: S. P. Rajaguru, T. Sivarani and S. Rajiva
Editorial Assistance : Purushotham Masuna
Photo Credits: T. K. Murali Das

Indian Institute of Astrophysics
II Block, Koramangala, Bangalore 560 034, INDIA
Tel : 91 (80) 2553 0672 Fax : 91 (80) 2553 4043
Voicemail : 91 (80) 2553 9250 E-Mail : newslet@iiap.res.in