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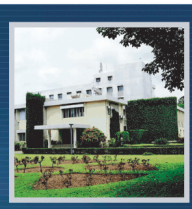


IIA Newsletter

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In this issue...

IIA Founder's Day

IIA celebrated Founder's day on the 10th August, 2009 with a public lecture to a packed auditorium by the internationally renown astrophysicist and pioneer instrument builder Govind Swarup.

For IIA, Founder's Day, the birthday of Vainu Bappu, is an occasion to come together and reflect on progress made towards its long-term vision, the foundations for which were laid by its founder. Vainu Bappu was responsible for the revival of optical astronomy in independent India, and brought the experience of his brilliant and prolific career in institutions world-wide to found and build research observatories in the country. He led the planning and building of IIA's 2.3m telescope now named after him, which remains the largest optical telescope in India. His intense love of nature of both earth and sky, and his holistic engagement with the personnel at all levels, brought a rich ambience to the institutes he created, at Kodaikanal, Kavalur and at Bangalore.

Govind Swarup brought the varied expertise of his initial research career that included mentoring by the renown Ron Bracewell of Stanford University, to pioneer world-class radio astrophysics research in India by building innovative radio observatories. He joined the Tata Institute of Fundamental Research in 1963 at the invitation of Homi Bhabha. He planned and built the Ooty Radio Telescope, whose flagship programme that used the lunar occultation technique made outstanding contributions to cosmology. He then conceived and led the execution of the Giant Metre-wave Radio Telescope near Pune in Maharashtra, which has grown into a world-class interferometric array producing cutting-edge research in a variety of fields. Besides which, his infectious enthusiasm has inspired an enormous number of young people who have grown into committed research scientists. Among the recent honours he received are the Grote Reber Medal (Australia) and the Lifetime Achievement Award of the Department of Atomic Energy (India).

In his rivetting lecture that was delivered in his characteristically candid and pragmatic style, Govind Swarup recalled the history of empirical astrophysics research in India and its impact on research productivity as well as capacity building. With personal anecdotes, he emphasised the extremely productive partnership between Indian industry and astrophysicists in building the many indigenous observing facilities that have made world-class contributions to research. He expressed his grave

concern for the fact that the Indian research community is currently unable to attract sufficient number of younger people to keep up with the requirements of the newer and ambitious research facilities that the community plans to build and operate in the future. He also expressed his concern that research institutions remained disconnected from universities. He advocated the doctrine that indigenous instrumentation development was key to nation-wide capacity building in the different dimensions of research.

Founder's Day at VBO

C Sivaram delivering a popular lecture to college students and lecturers on Founder's Day at VBO.

The highlight of Founder's day celebrations at the Vainu Bappu Observatory was a special outreach programme for college students. 60 physics students and eight lecturers from four different colleges of the district heard an enthralling lecture titled "New Frontiers in Astronomy" from C. Sivaram. They then participated in a Physics and Astronomy quiz. The Auxilum college, Vellore and Maruthar Kesari Jain College for Women, Vaniambadi, were the winners of the first and second prizes respectively. The visitors also had a tour of the telescopes, and watched the movie "Cosmic Collisions". The students spent their lunch and tea breaks discussing various aspects of astronomy, and were clearly enthused by the experience.

- C Muthumariappan

National Meeting on New Solar Observatories

A one-day national meeting to discuss current and future observational opportunities for research in solar physics was organised by IIA on the 22nd of August, 2009. About 35 solar physicists from all over the country got together at IIA to review the recent accomplishments with the existing facilities, and also the newly emerging tools and techniques in the field. A substantial part of the deliberations focused on the proposed new observatories, viz., the National Large Solar Telescope (NLST), the Multiple Application Solar Telescope (MAST) and the Visible Emission Line space Coronagraph (VELC).

The meeting was co-ordinated by Dipankar Banerjee and Siraj Hasan.

- Dipankar Banerjee

Sounding Oscillating Stars

Helioseismology is the study of seismic waves in the Sun. It has already proved to be a powerful tool to infer many characteristics of the Sun, such as the Helium content, the sound speed characteristics, the density profile and the rotation profile down to 0.2 $R_\odot$. With recent space missions such as MOST (Microvariability and Oscillations of Stars, Walker et al. 2003), CoRoT (Convection, Rotation, and Planetary transit, Michel et al. 2009) and Kepler (Borucki et al. 2009) - a NASA mission launched this year, whose first goal is to search for extra-terrestrial planets— asteroseismology is developing very fast and we are able now to study many other stars (e.g., Régulo & Roca-Cortés 2005, Appourchaux et al. 2008), specially the solar-like oscillating stars, whose oscillations are excited stochastically near the top layers of their convective zones.

We have investigated three stars, which have solar-like oscillations and observed with CoRoT: HD181906 (García et al. 2009), HD181420 (Barban et al. 2009) and HD175726 (Mosser et al. 2009a) are respectively a F8 dwarf, a F2 main sequence and a F9/G0 dwarf. For the first two stars, we have 5 month-long time series

and 27 days of data for the last one.

Before fitting the modes, we have studied the rotation period of the stars. Several methods have been used in the past based on stellar activity, and they include the method developed by Mosser et al. (2009b) and a wavelet technique. The surface rotation period is measured through observation of starspots as well as some modelling of spot lifetimes. We found that the surface rotation periods for our targets are 2.8 days (HD181906), 2.6 days (HD181420) and about 4 days (HD175726). An example with the wavelet technique is shown on Fig. 1.

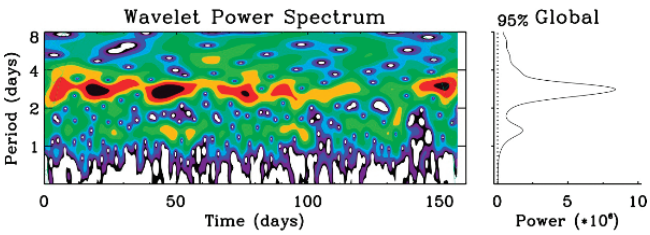


Fig.1: Left: Wavelet power spectrum for HD 181906 at low frequency. Right: Global wavelet power spectrum where the dotted-line represents the 95% confidence level (from García et al. 2009).

Another important parameter is $\delta\nu$, which is the spacing between consecutive orders of a given degree of a mode. This quantity is related to mass and radius of the star, through what we call the scaling laws and so it is very important to have some initial information on these parameters of the star. An example of frequency-range of the p-mode bump is shown in Fig. 2.

After fitting the background of the star (which should contain granulation and other stellar noise), we correct

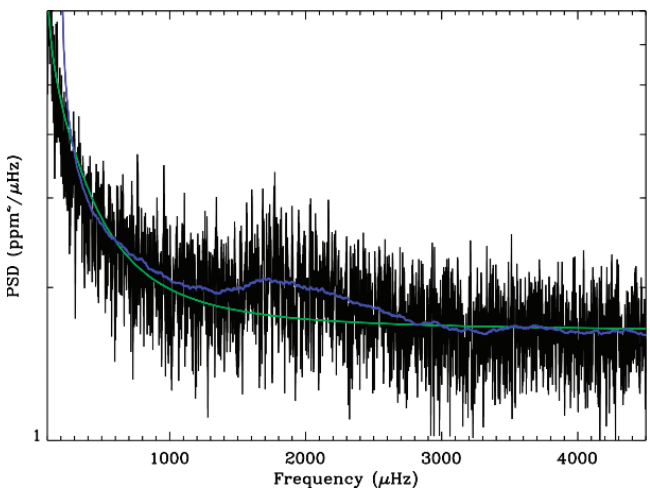


Fig. 2: Power spectrum density of the full length lightcurve smoothed by a boxcar of 70 points. The continuous green curve is the background fit (from García et al. 2009).

the power spectrum and calculate amplitude envelope of a mode, in particular the maximum amplitude per radial mode. From there, we can have a guess on the frequency of the modes and try to fit them. For stellar observations, we only have unresolved images, giving us access to low-degree acoustic modes, l = 0, 1, 2 and sometimes 3 if signal-to-noise ratio is high enough.

The modes are fitted by pairs in term of their degree: 0/2 and 1(/3). Several techniques have been used: a global fitting with maximum-likelihood or a fitting with Bayesian constraints. However, for HD181906 and 181420, for which we can see the p-mode bump more easily than in HD175726 data, it has not been possible to determine the modes in terms of their degree l and their order n. Both scenarios have been tested for the pairs of modes 0/2 and 1(/3). But unfortunately, the likelihood of the two scenarios are too close to determine which one is the correct one.

One result from these studies is the compatibility of $\delta\nu$ of these stars with what is expected by the theory, having some spectroscopic data on their masses and radii. Besides, it appears that the amplitudes expected for the modes are smaller than what was predicted by the theory. Thus, we still need to improve our knowledge on this characteristic and on the stellar modelling.

This is the beginning of a new adventure as more stars will be observed with CoRoT, and with data from the Kepler mission we will be able to analyse hundreds of solar-like oscillating stars at different evolution stages. By increasing our statistics, we will be able to better understand the stellar evolution as well as the physical processes occurring inside stars. *These results will appear in the journal Astronomy & Astrophysics (García et al. 2009, Barban et al. 2009, Mosser et al. 2009).*

References:

Appourchaux, T., et al. 2008, A&A, 488, 705
Borucki, W., Koch, D., Batalha, N., et al. 2009, in proceedings of IAU Symposium, Vol. 253, p289.
Michel, E., Baglin, A., Auvergne, M., et al. 2008, Science, 322, 558
Régulo & Roca-Cortés, 2005, A&A, 444, 5
Walker, G., et al. 2003, PASP, 115, 1023

- Savita Mathur

Supernova SN 2007ru: Adding to Diversity

Among the cosmic explosions of stars that we see as supernovae are a few that are believed to expand at as much as a tenth of the speed of light. The high velocities leave their footprint on their spectra in the form of broad emission lines. They are a subclass of core collapse supernovae of type 1c. Some of them are associated with Gamma Ray Bursts (GRBs) e.g., GRB980425/SN 1998bw and GRB031203/SN 2003lw , and others are associated with X-Ray Flashes (XRF), e.g., XRF060218/SN 2006aj.

The broad-line SNe Ic exhibit diversity in terms of the explosion energy, ejecta mass and mass of ^{56}Ni produced during the explosion. Among these, supernovae with kinetic energy $E_K > 10^{52}$ ergs are termed as “hypernovae”. The broad-line SNe that are not associated with GRBs are found to have smaller values of ejecta mass, explosion energy and lower luminosity as compared to the GRB-associated hypernovae (Nomoto et al. 2007).

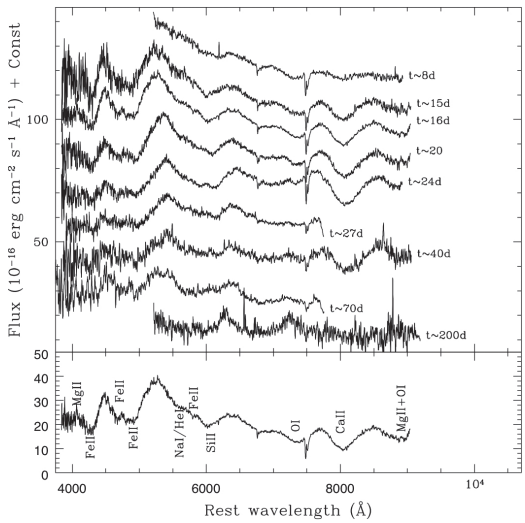


Figure:1

We conducted a detailed study of the photometric and spectroscopic evolution of the supernova SN 2007ru, using IIA's 2m Himalayan Chandra Telescope. SN 2007ru was discovered in the galaxy UGC 12381 by Donati et al. (2007). It is fast rising, of the broad-line type. Its light curve peaked with a short rise time of 8± 3 days, and It also appears relatively bright. The faster decline rate during the late phases than the rate expected due to radio active decay of ^{56}Co into ^{56}Fe, indicates inefficient trapping of γ-rays by the ejecta, and suggests a low column density.

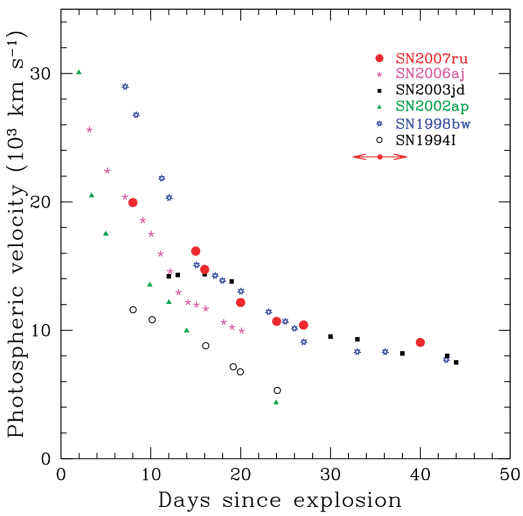


Figure:2

The optical spectra show broad features similar to that seen in GRB-associated SN 1998bw, XRF-associated SN 2006aj and the broad-line SN 2003jd (Figure 1). The expansion velocity of the ejecta was found to be comparable to the energetic SN 1998bw and higher than normal SNe Ic, SN 1994I and SN 2003. Except for the first few days, the photospheric velocity evolution of SN 2007ru was found to be similar to that of the broad-line SN 2003jd (Figure 2). The nebular spectrum of SN 2007ru was found to be dominated by broad forbidden emission lines of [O I] and [Ca II]. The profiles of [O I] 6300, 6364Å lines showed a sharp peak, as expected in an aspherical explosion viewed pole-on.

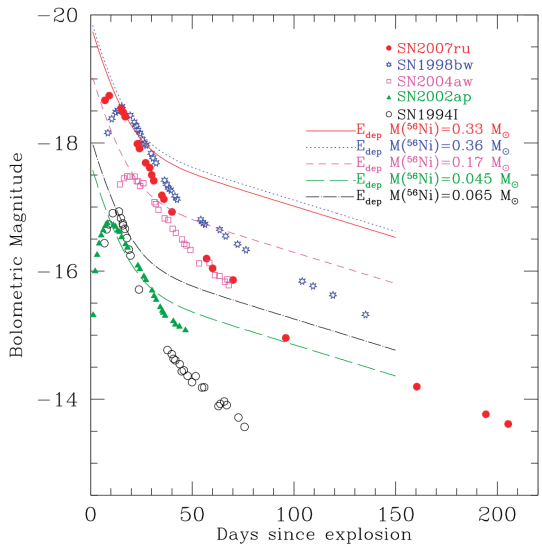


Figure:3

Using Arnett's rule (Arnett 1982), a ^{56}Ni mass of ~ 0.4$M_\odot$ is required to power the quasi-bolometric light curve derived from the observed **UBVRI** magnitudes including the NIR correction (Figure 3). The fast rise and decline of the light curve, together with the high velocity suggests an explosion with a high kinetic energy. A simple analytical calculation for the ejecta mass indicates a kinetic energy/ejecta mass ratio of ~3.8. The host galaxy UGC 12381 probably hosts a mild AGN with a nuclear HII region, while the supernova itself occurred in a region with near-Solar metallicity.

Nomoto et al. 2007 have shown a trend, although weak, wherein SNe having massive ejecta tend to have a larger kinetic energy and eject more ^{56}Ni, connecting normal SNe to GRB-associated SNe. In contrast, SN 2007ru which is at the higher energy end has a lower mass ejecta, leading to a higher ***E/M***. SN 2007ru thus adds to the diversity of SNe Ic. *The details of these results are published in the Astrophysical Journal (Sahu et al. 2009).*

References:
Arnett, W.D. 1982, ApJ, 253, 785.
Donati, S. et al. 2007, CBET, 1151
Mazzali, P.A. et al. 2007, ApJ, 670, 592
Nomoto, K. et al. 2007, arXiv:astroph/0702472.

- D. K. Sahu

RR Lyrae Stars in the LMC

The Large Magellanic Cloud (LMC) is known to be a disk galaxy with or without a halo. RR Lyrae stars (RRLS) which belong to population II stars are generally used as a tracer of the host galaxy halo. Subramaniam (2006) studied the density distribution of RRLS of the LMC using OGLE II data and found that it is elongated like the LMC bar, even though they are located in the inner halo.

The OGLE III catalogue of RRLS (Soszynski et al 2009), confirmed the bar like elongation of the density distribution. The surface as well as vertical distribution of RRLS using the 17693 ab type stars identified by the

OGLE III survey of the innerLMC, are studied to understand whether they are actually formed in the halo. A smooth spatial variation in the density is found to have an elongated distribution. The position angle (PA) of the elongation is estimated to be 125 ± 17.°. The bar type elongation shown by RRLS is similar to that delineated by red clump stars and red giants, which is the property of the LMC disk. In order to explore whether these stars also have the disk like inclination, their distribution was studied along the major and minor axes, taking the above PA as line of nodes. The extinction corrected (reddening estimated from red clump stars) mean magnitudes of the ab type RR Lyrae stars were plotted against the two axes, after binning. The almost horizontal distribution along the major axis confirms that the estimated PA is close to the line of nodes. The edge on view along the minor axis shows a variation in I_0 magnitude, which suggests an inclination of the plane containing the RRLS (Figure 1).

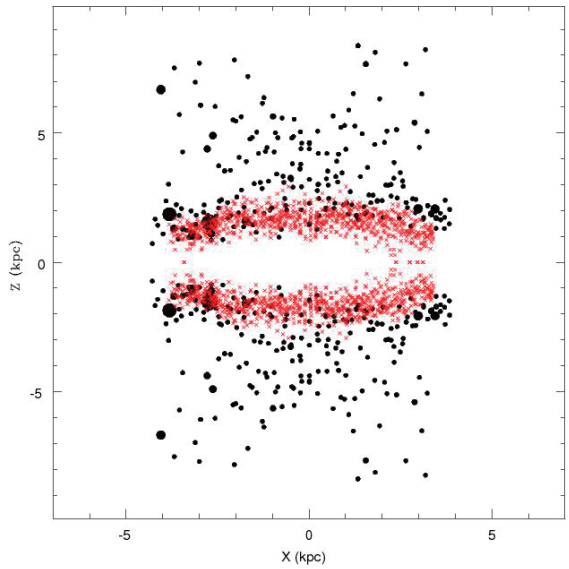


Figure:1 The edge on view of the binned I_0 magnitudes along the major and minor axes. The direction of the inclination is shown in the figure 2.

The inclination estimated is 31.3±3.°5, which is very similar to the previous estimates of the inclination of the disk. Thus RR Lyrae distribution shows two disk like properties, suggesting that a major fraction are formed in the disk, and not in the halo.

The I_0 magnitudes of ab type stars are also used to obtain their scale-height distribution. The observed distribution of ab type stars are binned and the mean magnitude and dispersion for 231 locations are estimated. The observed dispersion is an upper limit of the scale height. The observed dispersion in magnitude is converted into Z distance, halved and plotted in an edge-on view along the X-axis and shown in figure 2. The figure clearly shows two populations of RRLS, one population is very much like the red clump stars distribution, which is disk-like and the other a puffed distribution. This brings out that the RRLS in LMC are of two types, one disk-like and the other with a larger scale-height.

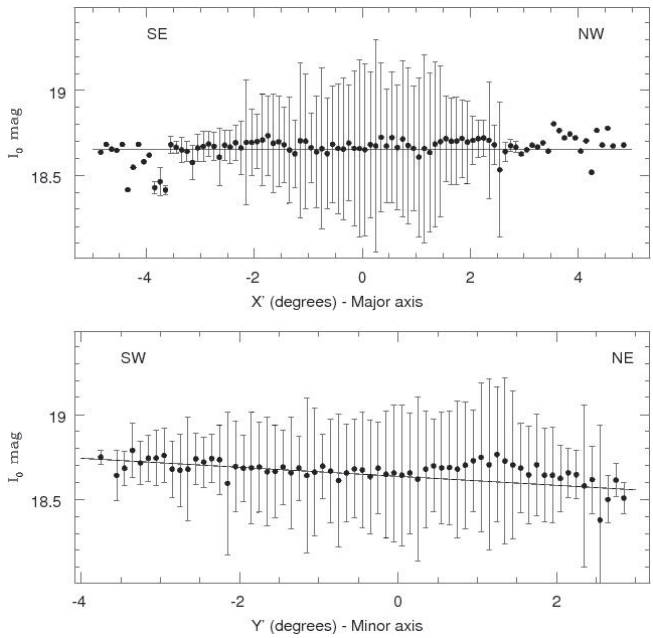


Figure:2 The distribution of scale-height of ab type RRLS (black) compared with that of RC stars (red). The scale heights shown are the dispersion in the mean magnitude reflected about z=0. The larger sized dots indicate larger error in the estimated dispersion.

The distribution of RRLS in the inner LMC is found to have major axis, line of nodes and inclination similar to those of the disk. These three suggest that the RRLS are not in a spheroidal system, but in an equatorial plane similar to that of the disk. These results indicate that the RRLS of the LMC trace the disk and probably the inner halo. They do not trace the extended metal poor halo of the LMC. We suggest that a major star formation event happened in the LMC 10-12 Gyr ago, resulting in the formation of most of the inner RRLS, globular clusters, resulting in the inner halo and the disk of the LMC. *These results will appear in the journal Astronomy & Astrophysics Letters (Subramaniam & Subramanian, 2009).*

References:

Subramaniam, A., 2006, A&A, 449, 101
Soszynski, I., et al. 2009, Acta Astron., 59, 1

- Annapurni Subramaniam & Smitha Subramanian

Visiting Students from the USA

Sarah E. Willis from Iowa State University, USA and Thomas A. Schad from the University of Arizona and National Solar Observatory, Tucson, USA, were visiting research students at IIA during June-August, 2009, under the International Research Experience for Students (IRES) programme sponsored by the National Science Foundation, USA.

The IRES programme, which is for graduate students of the United States to study astrophysics in India, is administered by the National Solar Observatory, Tucson, USA, and is currently co-ordinated by Kiran Jain from NSO, herself an alumnus of IIA. The programme aims to

IRES students Thomas Schad (left) and Sarah Williams (right),with Kiran Jain, the co-ordinator of the IRES programme (centre).

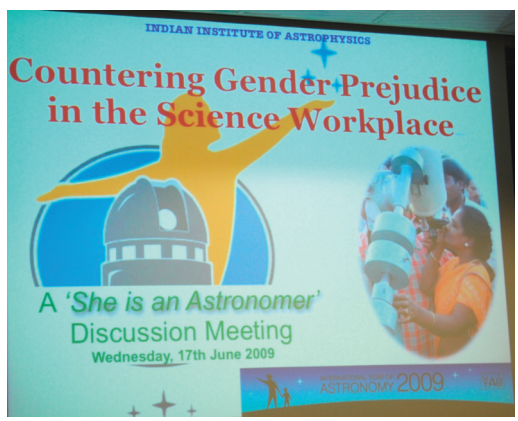
expose potential researchers to an international setting at an early stage in their careers. 2009 is the third year of the programme at IIA. The students associate with a faculty member at IIA for a research project, and also undertake visits to IIA's observatories and field stations. Cultural and social events are interleaved too. The programme covers the students travel and stay and allows them to extend their return date in order to be a tourist in India at the end of the research period.

Sarah Williams did a project with Annapurni Subramaniam on 'Spectroscopic study of Herbig Ae/Be stars', and Thomas Schad did a project with R. Kariyappa on 'The Dynamics of Coronal X-ray Bright Points in Relation to the Magnetic Field'.

Towards the end of their programme, Sarah and Tom, both first-time visitors to India, spoke to the editors about their experience, which, they said, was overall very useful scientifically, and taught them a lot of new science and also new techniques.

Some excerpts from the interview:
Editors: What motivated you to apply for the IRES programme?
Sarah: It seemed like a good opportunity to combine research with travel abroad!
Tom: I had worked in the area of Solar physics at Arizona. I wanted to work in the large group at IIA that participates in this research and feel part of the global Solar Physics community. I was also interested in the experience of a different culture.
Editors: Was the scientific experience at IIA very different or did it feel like more of the same thing?
Tom: The science aspect was very similar to what it is back home, and that sameness was somewhat comforting. But science is done somewhat differently here.
Sarah: The observatory visit showed this up in high contrast. For example, we found that during observations the guiding of the telescope was still done manually...
Tom: We joined the IIA team that conducted a solar eclipse-viewing event for the public on the 22nd July. One very striking element was that, while in the United States the science communicators at such an event would have to primarily field questions on why eclipses happen and so forth, at the IIA event at Lalbagh gardens, Ebenezer and others had to field a lot of questions about bathing and eating during the eclipse....
Editors: Was the ambience here very different from what you know of academic environments in the United States?
Tom: Compared to academic environments back home, there is somewhat less of student interactions, both academic and social. Also, the first-hand experience of poverty and its consequences and the contradiction of poverty vs. affluence so near at hand made for a bit of a culture-shock.
Editors: Has the culture-shock changed your perspective?
Sarah: Certainly - it has changed my perspective on my own problems...
Tom: You learn very quickly that there does not have to be an ocean between you and poverty...
Editors: What are your comments on the IRES programme?
Sarah: It is a very well conceived programme, but the duration should perhaps be a bit longer.
Tom: In order to have the rich experience of the various activities and field trips, and yet do substantial research on our research projects, a longer duration would help.
Editors: What would you say was the best aspect of your visit?
Sarah & Tom: The observatory visits were really nice, particularly because we had the company of the IIA PhD students, and the interactions with them made it our best experience.

The details of the IRES programme are available at *http://eo.nso.edu/ires/.*



As part of IIA's 'She is an Astronomer' corner-stone project activity in IYA09, an international discussion meeting was held at IIA on the 17th June, 2009, where astrophysicists, physicists and social scientists came

Gita Sen, Chair

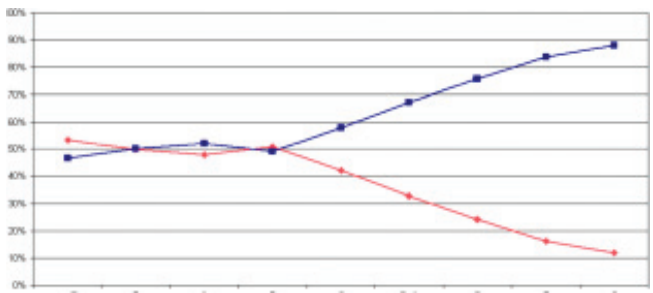
together to debate on the theme 'Countering Gender Prejudice in the Science Workplace'. Over 80 people that included scientists from IIA, ISAC, IISc, JNCAR and NIAS, as well as college students and members of the public, participated in the meeting.

Given that the vision of the International Year of Astronomy includes understanding how scientific knowledge can contribute to a more equitable and peaceful society, it is not surprising that the IYA effort to explore and redress gender-inequity in the sciences, titled 'She Is An Astronomer', has been designated as one of the International Year's corner-stone projects. The meeting at IIA was a follow-up on the 'She is an Astronomer' session that occurred in IIA's IYA09 preparatory workshop of April, 2008 (IIA Newsletter, June 2008, Vol.13, No.2, p11).

Left to Right: Mousumi Das, Danille Alloin, Prema Rajagopalan, Andrea Borch & Prajval Shastri.

The meeting was inaugurated by the Director, Siraj Hasan, and chaired by the eminent economist Gita Sen of the Indian Instiute of Management. In her introductory remarks, Gita Sen aptly summed up the intent by saying that it was all a matter of punctuation: The goal is to first move from 'She is an Astronomer?' or 'She is an Astronomer!' to 'She IS an Astronomer', and finally to, simply, 'She is an Astronomer'. Prajval Shastri (IIA) gave an overview of the issue. Categorising the possible moves to address gender inequity, she argued that governmental acceptance of the ubiquity of gender-based prejudice has come more readily than from within the science community, and though it was welcome, structural measures it undertakes should be those that lead to dissolving the gender-divisiveness in the long-term.

Danielle Alloin, renown astrophysicist from Saclay (France) gave extensive statistics from the European Union, especially representation of women relative to the available pool. She illustrated not only the well-known "vertical" bias, i.e., far heavier under-representation w.r.t. the available pool at high levels in the hierarchy and in high-level awards and recognitions; but also showed that while high-powered committees tended to be highly gender-imbalanced, committees that needed to do a lot of work, such as telescope user committees, often had 40% women! She called for serious attention to the need for female role models, and also for rigorous advertisement of high-level positions in institutions to prevent the obviously biased "old-boys networks" dominating hiring processes. Mousumi Das, astrophysicist from BITS Hyderabad, discussed the gender situation in astronomy in India. While there is a healthy inflow of girls into science, the leaky pipeline kicks in at roughly the post-PhD level. The 'Maternal Wall', i.e., the barrier to gender equity when women scientists enter parenthood, is not merely because of the extra and inequitable responsibility, but also because of the prevailing mind-set at the workplace, wherein a woman who has just turned into a parent is overnight regarded as a less able scientist, and incapable of being a competent parent and a competent scientist at the same time. She said that the mindset that stereotypes women as "passive", "nurturing", etc., also results in their exclusion from leadership positions in scientific projects.



The 'Scissors Diagram': Statistics for German academia from 2007, showing fraction of males & females (blue & red points respectively) as a function of level increasing to the right (high school, university, Ph.D., post-doctoral, through to professorship).

Andrea Borch, astrophysicist and post-doctoral fellow at IIA, presented the now-famous "Scissors diagram", which shows that the fraction of women/men is close to 50% at the school level, but increasingly deviates from 50% as one moves to higher levels in academia. She described the recent paradigm shift in the underlying theoretical framework adopted in the European Union, from "gender-equalisation" to "gender-mainstreaming", i.e., a shift from merely aiming for outcomes, to questioning the causal structures and processes, and a shift from merely having equal-opportunity officers working for gender equity, to having the management at each level being responsible for evaluating, innovating and changing processes towards gender neutrality. Prema Rajagopalan, sociologist from IIT-Madras, presented a very large number of extremely insightful observations from her extensive sociological investigations: e.g., even when the few women who do reach high in the hierarchy (when it becomes mandatory to make them chairs of internal committees), typically they land up not with any of the important committees, but with the likes of Guest House, stores, school and staff welfare committees. Studies on recommendation letters show clear trends of different characteristics being overplayed or underplayed for men and women,

clearly reflecting gender-biased mindsets of the recommender. Information on research funding and other opportunities tends to get passed around in the informal social networks of which women tend to be not part of. Women can therefore advance mostly when they have a mentor in the hierarchy.

Several new points were brought out in the brief remarks that followed from several respondents: Jayant Murthy, A. Vyas and Rekhesh Mohan from IIA, Suchitra Balachandran (Univ. of Maryland) and Shobhana Narasimhan (JNCAR). This was followed by a lively discussion. Gita Sen then delivered a fascinating set of concluding remarks, peppered with anecdotes. She stressed that science does not progress by objectivity alone but also by how scientists interact. While inequitable societal structures even in the sciences were alive and well, institutions, by implementing best practices internally, could go a long way to create a healthy and therefore productive gender environment at least from within. The participation of significant proportions of both genders, which was remarked upon as being unusual by many of the outside participants, was testimony to the recognition that the gender issue was not merely one of "justice for women" but also of general institutional concern from the point of view of scientific productivity. The meeting was organised by Prajval Shastri, Sabyasachi Chatterjee, Ravinder Banyal and S.P. Rajaguru.

IIA along with the Tamilnadu Science & Technology Centre organised two-day workshops for college students and teachers at the Periyar Science & Technology Centre, Chennai (26th & 27th June), and the Anna Science & Technology Centre, Tiruchirapalli (29th & 30th June), on the theme 'Understanding the Universe from Earth to the Galaxy: An Astrophysical Journey'. With the extensive help of M. Iyamperumal, Executive Director, Tamil Nadu Science & Technology Centre, and co-ordination by S. Soundararajaperumal, IIA alumnus who is now at the Tamilnadu Science & Technology Centre, nearly a hundred students and teachers from several colleges in the area were able to particpate in each workshop.

The topics were selected to cover several aspects of astrophysics, including solar, stellar and galactic physics, sun-earth interactions, and instrumentation. The students were also introduced to the time, mass and distance scales involved in astronomy and were shown how basic physical laws govern the birth, evolution and death of stars, and the thickness of our galaxy. At the Chennai workshop, P. Vishwanath explained the importance of the International Year of Astronomy, and narrated how the work of Galileo set in motion the advance of scientific reason that ushered in the era of enlightenment. Sundara Raman explained the observational facilities at the Kodaikanal Observatory, which recently celebrated its centenary.

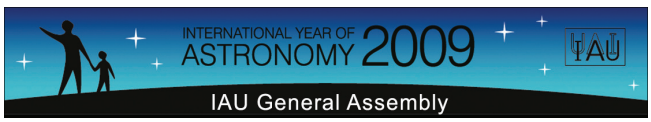
The Chennai workshop ended with a lively panel discussion on the theme of spreading the message of astronomy and scientific rationality. After the Trichy workshop, Dr. Azhagiriswamy, Project Director and other members of Science Centre arranged night-sky watching and a planetarium show for the participants.

K. Sundara Raman, Tushar Prabhu, P. Vishwanath, Sabyasachi Chatterjee, K. B. Ramesh, Firoza Sutaria and Ravinder Banyal were the IIA team members at Chennai, and K. Sundara Raman, Sabyasachi Chatterjee, K. B. Ramesh, Firoza Sutaria, Ravinder Banyal, S. Ramya and S. P. Rajaguru were the IIA team members at Trichy.

- K. Sundara Raman & Sabyasachi Chatterjee

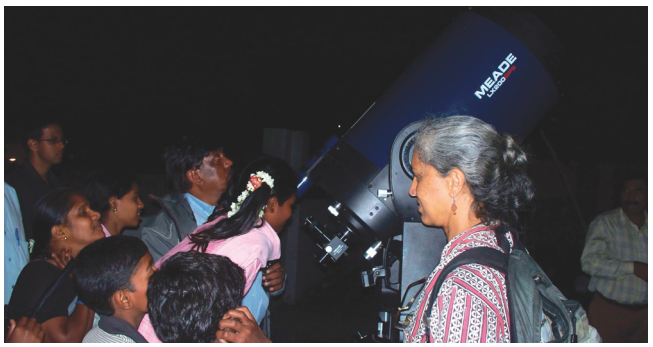
Siraj Hasan inaugurated the 32nd annual science festival of the Bangalore Science Forum on the 1st July, 2009, at the H Narasimaiah hall of National College. The science festival is an annual Bangalore celebration for and by science buffs. It was first proposed by the late H Narasimaiah, founder of the Bangalore Science Forum and an outstanding science populariser who strove to spread scientific temper among the public. In keeping

with 2009 being the international year of astronomy, the festival this year was kicked off with a lecture by Siraj Hasan on “New Windows to the Mysteries of the Sun”.



Siraj Hasan participated in the special session on the International Year of Astronomy at the XXVII General Assembly of the International Astronomical Union. This special session was held during 3-5 August, 2009 at the venue of the General Assembly at Rio de Janeiro, Brazil. The session, occurring eight months after the kick-off of the International Year, was an opportunity to showcase in one spot, the activities from around the planet that attempted to take astronomy and the excitement of science to the public. Siraj Hasan presented a poster from IIA entitled ‘Universalising the Universe: The IYA09 activities and approaches of IIA’ authored by P. Shastri, S. Chatterjee, R. Banyal and S.P. Rajaguru. Many of the activities and concepts had both a strong regional flavour and the potential to be adapted elsewhere. The session thus provided a forum for rich exchange of ideas to take the International Year celebrations forward.

An IIA outreach team together with Naveen Nanjundappa and Amar Sharma of the Bangalore Astronomical Society brought a sky-watching event to the final day of an astronomy summer camp for children run by the Drishya Kalike Kendra in Bayyappanhalli on the 3rd July, 2009. The Drishya Kalike Kendras (learning centres), of which there are three in Bangalore, attempt to respond to the needs of underprivileged children living in urban slums, by developing innovative curricula within non-school environments of learning. The summer camp sought to bring exposure of astronomy, space sciences and technology to these children in participatory ways, involving hands-on activities, the medium of stories, dance and theatre, and field-visits to ISRO facilities. On the final day, the children made a presentation, followed by sky-watching with IIA’s 14" telescope. Although the weather strongly threatened to be a damper, with clouds and even a drizzle, the children were very excited to just look at the telescope, which was mounted on the 2nd floor terrace of the centre. The sense of self-discipline of the children, combined with an abundance of energy and engagement was remarkable. As if in response, the drizzle stopped and the clouds parted, and allowed them to view the moon’s landscape through the telescope. It was an exciting experience for the children and very rewarding for the resource persons from both IIA and BAS.



Resource persons Amar Sharma (BAS), JPA Samson and Prajval Shastri at the sky-watch at Drishya Kalike Kendra

Sabyasachi Chatterjee (IIA) & Chinmoy Ghosh (IGNOU) (1st & 2nd from the right), at the IIA-IGNOU outreach programme, Patna.

IIA and the Indira Gandhi National Open University partnered in launching a country-wide series of astronomy outreach programmes, aimed at developing a scientific temper and sharing the spirit of science and with the public at large. This series was launched with two workshops, the first at Lucknow on the 20th July, in the Education Department of the Lucknow University, and inaugurated by the University’s Vice-Chancellor Dr. U.N. Dwivedi, and the second at Patna at the Indian Insitute of Business Management on the 21st July 2009.

At both the events, Chinmoy K. Ghosh of IGNOU and Sabyasachi Chatterjee of IIA were the main speakers. Dr. Ghosh emphasised that the IYA09 was meant not to commemorate a single person or discovery but to set forth a chain reaction, leading to wide emergence scientific rationality. Recalling that Galileo was thought of as the father of modern science, Sabyasachi

Chatterjee described how Galileo put primacy on experiments, but also brought in a synthesis of theory and experiments and was the father of "Galilean relativity", on which Newton's works rest.

Each of the meetings were attended by eminent academics and over hundred students and teachers. The talks were followed by lively discussions on astronomy, its advances, the impact on human thought and world views. The Patna workshop had a special significance since it was on the day before the total solar eclipse there. The speakers debunked astrology and superstitions surrounding eclipses, and urged the audience to view the eclipse of the following day.

- Sabyasachi Chatterjee

* Palahalli Vishwanath: *Galileo and the Night Sky*, Tibet School, Leh (2 June)
* Palahalli Vishwanath: *Galileo and the Night Sky*, Government College, Leh (2 June)
* Palahalli Vishwanath: *Galileo and the Rise of Science*, Inter University Accelerator Centre, New Delhi (3 June)
* Prajval Shastri: *ಅಂತರ ರಾಷ್ಟ್ರೀಯ ಖಗೋಳ ವಿಜ್ಞಾನ ವರ್ಷ, International Year of Astronomy* (in Kannada), Govt. of Karnataka Education Officers' Workshop, Bangalore (5 June)
* C. Muthumariappan: *Astronomy & Modern Civilization*, Tamilnadu Science & Technology Centre (10 June)
* Palahalli Vishwanath: *Galileo and the Rise of Science*, National College, Bangalore (13 June)
* Palahalli Vishwanath: *Life and Work of Galileo*, Tamilnadu Science & Technology Centre, Chennai (26 June)
* K. B. Ramesh: *Sun-Earth interaction*, Tamilnadu Science and Technology Centre, Chennai (26 June)
* Tushar Prabhu: *Galaxies, the Question of Vastness Revisited*, Tamilnadu Science & Technology Centre, Chennai (26 June)
* S. Chatterjee: *How Thick is our Galaxy? A Text book Approach*, Tamilnadu Science & Technology Centre, Chennai (26 June)
* Palahalli Vishwanath: *Spectroscopy the Science of Colours*, Tamilnadu Science & Technology Centre, Chennai (27 June)
* Firoza Sutaria: *Stars, from Birth to Death*, Tamilnadu Science & Technology Centre, Chennai (27 June)
* Firoza Sutaria: *Stars, from Life after Death*, Tamilnadu Science & Technology Centre, Chennai (27 June)
* Ravinder K Banyal: *Telescopes through the Ages*, Tamilnadu Science & Technology Centre, Chennai (27 June)
* K. Sundara Raman: *Solar Observations at Kodaikanal Observatory*, Tamilnadu Science & Technology Centre, Chennai (27 June)
* S. Chatterjee: *A Journey in Physics*, Anna Science & Technology Centre, Tiruchirappalli (29 June)
* K. Sundara Raman: *Basis of Solar Physics*, Anna Science & Technology Centre, Tiruchirappalli (29 June)
* K. B. Ramesh: *Sun-Earth Interaction*, Anna Science & Technology Centre, Tiruchirappalli (29 June)
* S. Ramya: *Galaxies, the Question of Vastness Revisited*, Anna Science & Technology Centre, Tiruchirappalli (29 June)
* S. Chatterjee: *How Thick is our Galaxy? A Text book Approach*, Anna Science & Technology Centre, Tiruchirappalli (29 June)
* S. P. Rajaguru: *What goes on Inside a Typical Star like the Sun?*, Anna Science & Technology Centre, Tiruchirappalli (30 June)
* Firoza Sutaria: *Stars, from Birth to Death*, Anna Science & Technology Centre, Tiruchirappalli (30 June)
* Firoza Sutaria: *Stars, from Life after Death*, Anna Science & Technology Centre, Tiruchirappalli (30 June)
* Ravinder K Banyal: *Telescopes: A Window to our Universe*, Anna Science & Technology Centre, Tiruchirappalli (30 June)
* K. Sundara Raman: *Solar Observations at Kodaikanal Observatory*, Anna Science & Technology Centre, Tiruchirappalli (30 June)
* Prajval Shastri: *The Fascinating Cosmos*, CNR Rao Hall of Science and Education Technology, JNCAR, Bangalore (30 June)
* Siraj Hasan: *New Windows to the Mysteries of the Sun*, Bangalore Science Forum, National College (1 July)
* S. P. Rajaguru: *Solar Eclipses*, Visvesvaraya Industrial and Technological Museum, Bangalore (16 July)
* B. Ravindra: *Total Solar Eclipse -July 22nd 2009*, Jayshree English Medium High School, Anekal, Bangalore (16 July)
* Prajval Shastri: *ನಮ್ಮ ವಿಶ್ವಮತ್ತು ಖಗೋಳ ವಿಜ್ಞಾನ ವರ್ಷ, Our Universe and the Year of Astronomy* (in Kannada), IYA09 State-Level Teachers' Workshop, Karnataka Rajya Vijnana Parishat, Bangalore (16 July)
* Prajval Shastri: *The Sun, the Cosmos and I*, Solar Eclipse Science Festival, Patna (21 July)
* Prajval Shastri: *सूर्य, विश्व और मैं, The Sun, the Cosmos and I,* (in Hindi), Solar Eclipse Science Festival, Patna (21 July)
* Firoza Sutaria: *The Solar Corona*, Jadavpur University, Kolkotta (24 July)
* C. Sivaram: *New frontiers in Astronomy*, Bangalore Science Forum, National College (29 July)
* A. Vyas: *Astronomy and Optics*, Department of Physics, National Institute of Technology, Tiruchirapalli (6 August)
* P. R. Vishwanath: *Galileo and the Rise of Science*, Jawaharlal Nehru University, New Delhi (6 August)
* Firoza Sutaria: *The Life and Death of Stars*, Aditya school, Bangalore (8 August)
* Ravinder K Banyal: *400 Years of Telescope*, Sri Sathya Sai Institute of Higher Learning, Prasanthi Niliyam (8 August)
* C. Sivaram: *Space & Rocket Dynamics*, St. Joseph's College and ISRO, Bangalore (9 August)
* K. Nagaraju: *ವಿಶ್ವದಲ್ಲಿ ನಮ್ಮ ಸ್ಥಾನ ಏನು?. What is Our Place in the Universe?* (in Kannada) , Vishwa Bharathi Junior College, Mallasandra, Bangalore (14 August)
* C. Sivaram: *Physical Limitations on Information Processing*, Jyoti Nivas College, Bangalore (20 August)
* C. Sivaram: *Gravitational Wave Detectors*, St. Joseph's College, Bangalore (21 August)
* Prajval Shastri: *Munching Black Holes and Growing Galaxies*, School children's programme, IIA (26 August)
* P. K. Mahesh: *Design of Astronomical Telescopes-some aspects*, Perumal Manimekalai Polytechnic College Students, VBO, Kavalur (28 Aug)
* Ravinder K Banyal: *400 years of Astronomy*, Sona College of Technology, Salem (29 Aug)
* Ravinder K Banyal: *400 Years of Telescope (translated to Tamil by Ajith Padmanabhan)*, Salem Astronomical Society, Salem (29 Aug)
* Prajval Shastri: *Our Enchanting Universe*, University Womens Association, Bangalore (29 Aug)

सूर्य ग्रहण Eclipse!

सूर्य ग्रहण ! अंजी, चीन का अभियान

22 जुलाई 2009 को सदी के सबसे लंबे पूर्ण सूर्य ग्रहण के अध्ययन के लिए पूर्वी चीन पहुँचे भारतीय ताराभौतिकी संस्थान अभियान दल का भाग्य ने बख़ूबी साथ दिया। दल का उद्देश्य इस अनूठे अवसर द्वारा इस संभावना का पता लगाना था कि क्या चुबंक द्रवगतिकीय तरंग सौर किरीट को तप्त करती है ?

इस प्रयोग के लिए अंजी का चुनाव पूर्णता अवधि (5 मिनट 38 सेकेंड) तथा अच्छे मौसम की संभावना को देखते हुए किया गया। दल ने अपना कैंप एक विशाल जलाशय के पास 890 मीटर (38 डिग्री 28' उ, 119 डिग्री 35' पू) की ऊँचाई पर स्थापित किया। दो भिन्न उत्सर्जन रेखाओं पर यथा- 530.3 एन एम पर हरे [Fe XIV] उत्सर्जन रेखा एवं 637.4 एन एम पर लाल [Fe X] उत्सर्जन रेखा सौर किरीट के उच्च-केडेंस प्रतिबिंब प्राप्त करने के लिए 40 सें.मी. वाले टेलीस्कोप स्थापित किए गए। इसके अतिरिक्त सौर तथा किरीट प्रकाश को अभिदृश्य तक पहुँचाने तथा उच्च प्रकीर्णन स्पेक्ट्रोग्राफ़ के लिए 30 से.मी आमाप के तारास्थापी (सीलोस्टटे) को भी स्थापित किया गया।

सूर्य ग्रहण के नियत दिन से पूर्व सारी तैयारियाँ संपन्न कर ली गईं। यंत्रों की स्पेक्ट्रल अनुक्रिया के अंशांकन, प्रतिबिंब के हिलीयोग्राफ़िक निर्देशांक तथा सौर किरीट पर स्पेक्ट्रोग्राफ़ स्लिट स्थान निर्धारण के लिए न्यूट्रल घनत्व वाले फ़िल्टरों द्वारा सूर्य के स्पेक्ट्रा तथा प्रतिबिंब लिए गए।

22 जुलाई 2009 को आसमान सूर्य ग्रहण के प्रतिबिंबिन के लिए साफ था। सौर प्रतिबिंब के ड्रिफ्ट को कम करने के लिए टेलीस्कोप तथा सीलोस्टेट को संरेखित किया गया। इन टेलीस्कोपों के इष्टतम एक्सपोजर समय की व्युत्पत्ति कावलूर वेधशाला में चंद्र के प्रेक्षण द्वारा पूर्व निर्धारित कर ली गई थी। हरे तथा लाल उत्सर्जन रेखाओं द्वारा किरीट के 400 मिलीसेकेंड का एक्सपोज़र प्राप्त किया गया।

चूँकि सूर्य इस क्षण अपनी न्यूनतम सक्रियता प्रावस्था से गुजर रहा है, अत: किरीट विसरित तथा संरचना-विहीन प्रतीत होता है। प्रतिबिंब तथा स्पेक्ट्रा का विश्लेषण प्रक्रियाधीन है। इस अभियान का नेतृत्व सिराज हसन ने किया तथा जगदेव सिंह, दीपांकर बैनर्जी, बी नागराज, के रवि तथा एफ गैबरीयल इस दल के सदस्य थे।

Eclipse Expedition to Anji, China

Luck was on the side of the IIA expedition that travelled to eastern China to study the longest total solar eclipse of the century on the 22nd July, 2009. The team aimed to use the unique opportunity of the eclipse to investigate the possibility that magnetohydrodynamic waves drive the heating of the solar corona.

Anji in China was the carefully chosen site of the experiment, after optimising for both the duration of totality (5 minutes 38 seconds) and the likelihood of good weather conditions. The IIA team set up camp by the side of the huge water reservoir at an altitude of 890m (at 38 degree 28' N, 119 degree 35' E). Two 40-cm telescopes (see photograph) were set up to take high-cadence images of the solar corona in two different emission lines, viz., the green [Fe xiv] emission line at 530.3 nm and the red [Fe X] emission line at 637.4 nm.

In addition a coelostat of 30-cm size was installed to feed the solar and coronal light to a 10-cm objective

अंजी, चीन में संस्थान की टीम के साथ पर्पल माउटेंन वेधशाला, नेनजिंग, चीन के स्नातक छात्र टूआन हुइ।

The IIA team at the camp at Anji, China, along with graduate student Tuan Hui from the Purple Mountain Observatory, Nanjing, China.

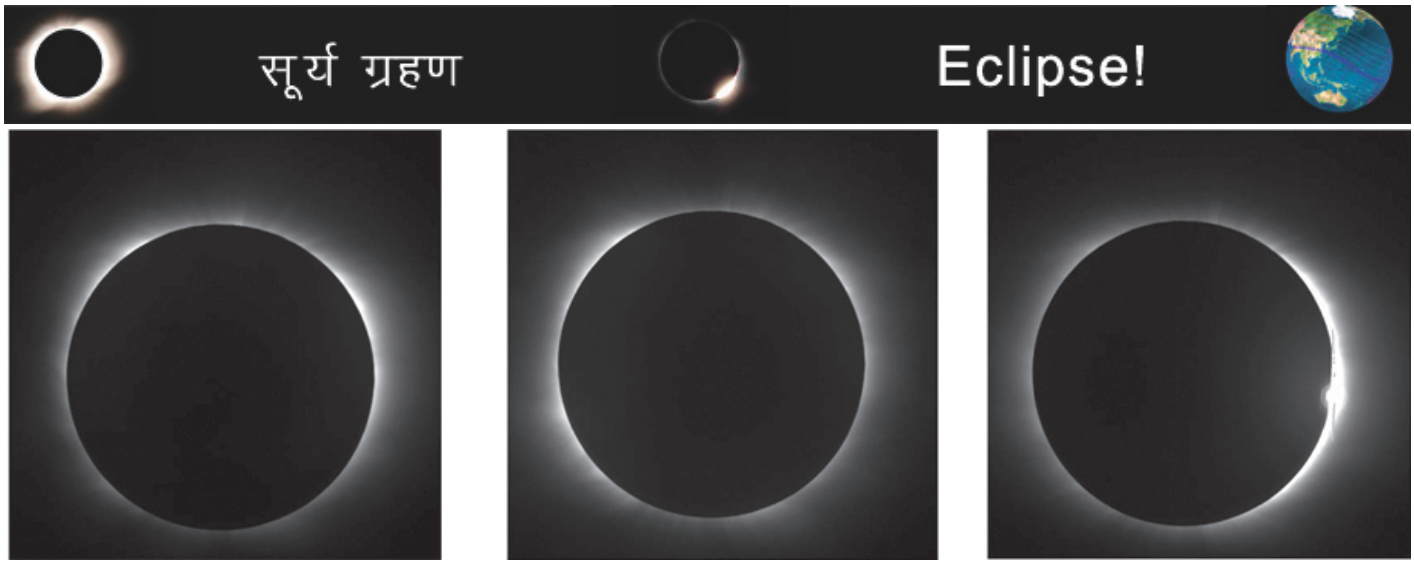
and a high dispersion spectrograph. (The equipment was described in the previous IIA Newsletter of June, 2009, Vol.14, No. 2).

सूर्य प्रेक्षण के लिए संस्थान के टेलीस्कोप तथा अन्य यंत्र

The IIA telescopes and other equipment for the solar observations

The days before the eclipse were spent readying for the experiments of the big day. Spectra and images of the sun using neutral density filters were taken in order to calibrate the spectral response of the instruments, fix the heliographic coordinates of the images and position the slit of the spectrograph on the solar corona.

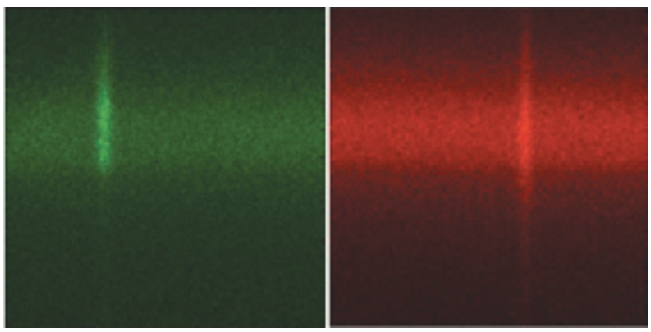
On the 22nd July, the sky, though not perfect, was clear enough to image the eclipsed sun. The telescopes and coelostat were aligned to minimise drift of the solar image, which was about one arcsec in 10 minutes. Optimum exposure times for imaging had already been derived earlier by observing the moon with these telescopes at Kavalur Observatory (the intensity of the solar corona being of similar magnitude as that of the full moon). The estimated optimum exposure was fine-tuned for the thin clouds present, using trial exposures at the beginning of totality. 400millisecond exposures of the corona were obtained in the green and red emission lines (Figure 2).



आरेख - 1: प्रथम दो पैनलों में सूर्य के लाल और हरे फिल्टरों के माध्यम से लिए गए प्रतिबिंब हैं। तृतीय पैनल (लाल फिल्टर)में पूर्णता के अंत से ठीक पूर्व डायमंड रिंग दर्शाती है।

Figure-1: The first two panels show the Solar image taken with the red and green filters respectively (exposure: 400 ms; spatial binning: 2x2). The third panel (red filter) shows the "Diamond ring" just before the end of totality.

Amidst all the anxiety about getting the instrumental set up right, however, the team did not miss the beauty of the mid-morning twilight, and the spectacular naked-eye sight of the solar orb turning into a black disc.



आरेख -2 : 5303 Å पर हरे [Fe XIV] तथा 6374 Å पर लाल [Fe X] रेखा के क्रमश: अप्रक्रियाकृत वर्णक्रम (5 सेकेंड का एक्सपोज़र)

Figure-2: The raw spectra of the Fe XIV green line at 5303 Å and Fe X red line at 6374 Å respectively (exposure of 5 seconds).

Since the Sun is going through its minimum activity phase at the moment, the corona appears diffuse and relatively lacking in structure. The image of the corona shows fine plume-like features at the poles. Analysis of the images and spectra are underway. The expedition was lead by Siraj Hasan, and Jagdev Singh, Dipankar Banerjee, B. Nagaraju, K. Ravi and F. Gabriel were the team members.

- Jagdev Singh & Dipankar Banerjee

सूर्य

सूर्य सौरमंडल के केन्द्र में स्थित एक तारा है जिसके चारों तरफ पृथ्वी और सौरमंडल के अन्य पिंड घूमते हैं। सूर्य हमारे सौर मंडल का सबसे बड़ा पिंड है और उसका व्यास लगभग 13 लाख 90 हज़ार किलोमीटर है जो पृथ्वी से लगभग 109 गुना अधिक है। ऊर्जा का यह शक्तिशाली भंडार मुख्य रूप से हाइड्रोजन और हीलियम गैसों का एक विशाल गोला है। परमाणु विलय की प्रक्रिया द्वारा सूर्य अपने केंद्र में ऊर्जा पैदा करता है। सूर्य से निकली ऊर्जा का छोटा सा भाग ही पृथ्वी पर पहुँचता है जिसमें से 15 प्रतिशत अंतरिक्ष में परावर्तित हो जाता है, 30 प्रतिशत पानी को भाप बनाने में काम आता है और बहुत सी ऊर्जा पेड़-पौधे समुद्र सोख लेते हैं। इसकी मजबूत गुरुत्वाकर्षण शक्ति विभिन्न कक्षाओं में घूमते हुए पृथ्वी और अन्य ग्रहों को इसकी तरफ खींच कर रखती है। सूर्य से पृथ्वी की औसत दूरी लगभग 14,96,00,000 किलोमीटर या 9,29,60,000 मील है तथा सूर्य से पृथ्वी पर प्रकाश को आने में 8.3 मिनट का समय लगता है। पृथ्वी से सूर्य की जिस चमकीली सतह को हम देखते हैं, वह सूर्य का प्रकाशमंडल (फोटोस्पीयर) है। इसी प्रकाशमंडल की किरणों का उत्सर्जन होता है। सूर्य के केंद्र भाग में विविध किरणों के रूप में जो भीषण ऊर्जा पैदा होती है, वह शनै:-शनै: इसकी सतह पर पहुँचती है। इसी प्रकाशीय ऊर्जा से प्रकाश-सश्लेषण नामक एक महत्वपूर्ण जैव-रासायनिक अभिक्रिया होती है जो पृथ्वी पर जीवन का आधार है। यह पृथ्वी के जलवायु और मौसम को प्रभावित करता है। सूर्य के बिना हमारा जीवन संभव नहीं है। सूर्य की प्रत्येक हलचल का पृथ्वी और उसके जीव-जगत पर प्रभाव पड़ता है। सूर्य की सक्रियता बढ़ जाती है, तो हमारे वायुमंडल और संचार-साधनों पर उसका गहरा प्रभाव पड़ता है। ग्यारह वर्ष के एक चक्र में सूर्य की सक्रियता का फसलों पर और मनुष्य के स्वास्थ्य पर भी प्रभाव पड़ता है। प्रत्येक सूर्य की सतह का निर्माण हाइड्रोजन, हिलियम, लोहा, निकेल, ऑक्सीजन, सिलिकन, सल्फर, मेग्निसियम, कार्बन, नियोन, कैल्सियम, क्रोमियम तत्वों से हुआ है। इनमें से हाइड्रोजन सूर्य के सतह की मात्रा का 74 % तथा हिलियम 24 % है।

इस जलते हुए गैसीय पिंड की छवि को उपयुक्त यंत्र से देखने पर इसकी सतह पर छोटे-बड़े धब्बे दिखलाई पड़ते हैं। इन्हें सौर कलंक कहा जाता है। ये कलंक अपने स्थान से सरकते हुए दिखाई पड़ते हैं। इससे वैज्ञानिकों ने निष्कर्ष निकाला है कि सूर्य पश्चिम से पूरब की ओर 27 दिनों में अपने अक्ष पर एक परिक्रमा करता है। जिस प्रकार पृथ्वी और अन्य ग्रह सूरज की परिक्रमा करते हैं उसी प्रकार सूरज भी आकाश गंगा के केन्द्र की परिक्रमा करता है। इसको परिक्रमा करनें में 22 से 25 करोड़ वर्ष लगते हैं, इसे एक निहारिका वर्ष भी कहते हैं। इसके परिक्रमा करने की गति 251 किलोमीटर प्रति सेकेंड है।

- एस. एन. महेश

एक अनूठी सुबह-ए-बनारस

वारणासी के 'सामन' घाट पर श्वेत-प्रकाश फोटोग्राफी के लिए पहुँचे भारतीय ताराभौतिकी संस्थान दल को निराश नहीं होना पड़ा क्योंकि आसमान साफ था और यह अनुभव मंत्रमुग्ध करने वाला सिद्ध हुआ। वारणासी अपनी सुबह-ए-बनारस के लिए भी प्रसिद्ध है क्योंकि यहीं पर गंगा के किनारे से सूर्योदय के विस्मित करने वाले दृश्य देखे जा सकते हैं। ऐसा ही एक स्थान 'सामने' घाट है। यहाँ पानी के मध्य मोती सदृश बालू का एक छोटा-सा द्वीप था। 22 जुलाई 2009 को सूर्योदय होने के साथ ही ये अटकलें लगाई जा रही थीं कि आसमान में बादल घिरे रहेंगे परंतु जल्द ही आसमान साफ हो गया। जीवनकाल की एकमात्र अद्भुत झलक देखने के लिए हमारे दल के साथ हजारों लोग एकत्र हुए जिनमें स्कूली

सूर्य ग्रहण Eclipse!

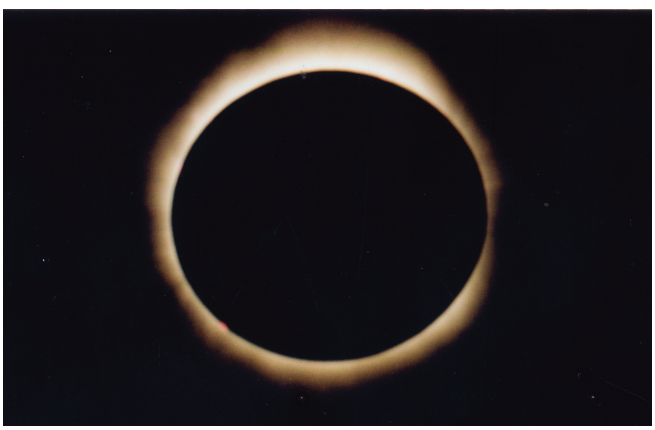
बच्चों के साथ-साथ मीडिया के लोग भी उपस्थित थे। वहाँ पर उपस्थित लोगों की सुविधा के लिए लाऊडस्पीकर का भी प्रबंध किया गया था, जिसके द्वारा सूर्यग्रहण के सही समय की जानकारी उन्हें दी जा रही थी।

जैसे ही सूर्य ग्रहण के द्वितीय संपर्क का समय करीब आया तो सब मौन हो गए और वातावरण में उद्विग्नता छा गई। आकाश में इतना अंधेरा नहीं हुआ जितनी अपेक्षा की जा रही थी। बेली बीड्स तथा स्वर्ण जटित हीरक अंगूठी जैसी डायमंड रिंग प्रकट हुआ तथा धीरे-धीरे मंद होने लगा और इसके साथ ही श्याम डिस्क के इर्द-गिर्द विकिरण किरीट दिखाए देने लगा। वहाँ उपस्थित लोगों ने एक-दूसरे के गले मिलकर अपनी प्रसन्नता व्यक्त की। सूर्य ग्रहण के पूर्णता अवधि के दौरान आसमान में शुक्र ग्रह दृष्टिगोचर हुआ साथ ही कुछ लोगों ने बुध ग्रह के दिखने का दावा भी किया। सूर्य ग्रहण के तृतीय संपर्क के बाद भी पक्षियों की तेज चहक सुनाई पड़ती रही।

हमारे समक्ष एक ऐसा सौंदर्य प्रकट हुआ जिसे न शब्दों में व्यक्त किया जा सकता है न ही कोई कैमरा उसकी प्रतिकृति उसके पूर्ण रूप में प्रस्तुत कर सकता है। इसे शायद जयशंकर प्रसाद की 'कामायनी' की प्रसिद्ध पंक्ति - प्रथम कवि का ज्यों सुंदर छंद" से ही अभिव्यक्त किया जा सकता है। हमारे संस्थान से लेखक एवं टी.के. मुरलीदास के साथ बनारस हिन्दू विश्वविद्यालय के प्रौद्योगिकी संस्थान के भोलानाथ द्विवेदी तथा मुकुल कुमार सहित कैलिफॉर्निया स्टेट यूनिवर्सिटी, नॉर्थ रिज के देवी प्रसाद चौधरी इस अभियान में सम्मिलित हुए।

A *Subah-e-Banaras* with a Difference

The IIA team that went to *Saamne Ghat* at Varanasi to perform white-light photography of the sun during the total solar eclipse, had clear skies and a spell-binding experience. Varanasi is famous for its *Subah-e-Banaras*, the breathtaking view of the city at sunrise from vantage points along the banks of the Ganga. The *Saamne Ghat* is one such point, with a small but beautiful sandy island in the middle of the waters. At day-break on the 22nd July, there was an apprehension that clouds may be the spoiler, but they cleared soon enough. The "second contact" (the beginning of totality) was to occur at about 06:24IST, with the Sun at approximately 13 degrees above the horizon. About a thousand people including school children and media persons gathered at the site to join the IIA team to watch the spectacle of a lifetime. A public address system was installed to announce the countdown for the benefit of the observers and everyone else present.



रमेश कपूर एवं मुकुल कुमार द्वारा 100 ASA फिल्म पर 1400 मि.मी. क्वेस्टार से 22 जुलाई 2009 को 'सामने' घाट, वाराणसी से लिया गया पूर्ण सूर्य ग्रहण का चित्र

The eclipsed sun from Saamne Ghat, Varanasi (100 ASA Kodak film with a 1400mm Questar) by Ramesh Kapoor & Mukul Kumar.

As the moment of second contact approached, all became quiet though the tension could be felt in the air. The sky did not get as dark as was expected - the ambience was pearly blue. The Bailey's beads and a tiny diamond ring appeared, gradually fading and paving the way for the radiant corona around the black disc.

People cheered and hugged each other as they got the breathtaking view of the corona in the sky, which could be seen up to several solar radii. During totality, the planet Venus was visible high up in the sky, while some claimed to have seen Mercury near the horizon, as also the shadow bands on the ground. The loud chirping of birds could be heard well past the third contact.

एक उद्विग्न प्रतीक्षा (बाएं से क्रमश: प्रथम भोलानाथ द्विवेदी, तृतीय मुरलीदास एवं पंचम रमेश कपूर)

The nervous wait. (Bhola Nath Dwivedi, Muralidas and Ramesh Kapoor are first, third and fifth from left respectively).

Here was a beauty no words can describe and no camerawork can faithfully reproduce. Perhaps the famous line from Jaishankar Prasad's *Kamayani* describes it - *'Pratham kavi ka jyon sunder chhand'* (as beautiful) as the first elegant lines composed by a poet! The IIA team of Ramesh Kapoor and T. K. Muralidas were joined by Bhola Nath Dwivedi and Mukul Sharma from Institute of Technology, BHU, and Debi Prasad Choudhary from the California State University, Northridge, USA.

- Ramesh Kapoor

About a thousand scientists, teachers and science activists from all over the country gathered at Patna to celebrate the Surya Grahan Utsav (Solar Eclipse Festival) preceding the total solar eclipse of the 22nd

सूर्य ग्रहण Eclipse!

July, 2009. The festival was organised by the All-India Peoples' Science Network in partnership with Sri Krishna Science Centre (Patna), Nehru Bal Bhavan (Patna), the Bihar State Education Department, the Department of Science & Technology, Government of India, and IIA.

About 500 school teachers from Bihar also participated in the event. The festival was inaugurated by A. K. Singh, Principal Secretary (MHRD), Government of Bihar, and had a range of programmes held at multiple venues around Gandhi Maidan, including lectures, multi-media presentations, film shows, hands-on activities such as telescope and pin-hole camera making, solar projections with mirrors, and other activities for children. Sabyasachi Chatterjee and Prajval Shastri gave lectures at the festival in both English and Hindi.

On the morning of the eclipse, all the festival participants as well as about 15,000 members of the public gathered at the Gandhi Maidan to view the eclipse. The viewers could have been luckier. The skies clouded out and the sun was hidden. There was a downpour! But the darkness that fell at the beginning of totality had a special unique quality. Many of those gathered celebrated the "cloudy eclipse" by frying and eating samosas along with sips of tea. Soon after totality the clouds parted again, and the public viewed the crescent sun with solar filters - an opportunity to talk about what an eclipse was, what it meant and the myths surrounding it. Sabyasachi Chatterjee, Prajval Shastri, Firoza Sutaria and Andrea Borch were the resource persons from IIA.

A Clouded out Eclipse at the Lalbagh Rock

Over 500 people participated in the eclipse-viewing event that was organised by IIA in collaboration with the Bharathiya Gyan Vignan Samithi (BGVS) during the wee hours of the 22nd July at the rocky outcrop in Bangalore's Lalbagh gardens.

The IIA team was well-equipped with telescopes to project the Sun's image onto a screen, and with solar filters for

Demonstrating safe viewing of the Sun using solar filters

the public to view the Sun directly. But Bangalore was only to see a partial solar eclipse at best, and at that early hour, it was known that the sun would be very close to the horizon, not conducive to a clear view. Furthermore, the break of day saw a rather cloudy sky, and the actual eclipse therefore escaped the public eye... Nevertheless, a very enthusiastic crowd gathered and interacted with the scientists and communicators, to discuss telescopes, safety of sun viewing, solar filters, the physics behind eclipses and astronomy in general. The media persons who were present to cover the event live on TV also participated in the conversations.

The crowd at Lalbagh partook in refreshments during the eclipse

A highlight of the event was that the peninsular Gneiss monolith in the gardens formed an enchanting picnic spot with the IIA and BGVS teams distributing sumptuous refreshments! The food and drink was arranged with the specific aim of having a "do-and-tell", to dispel superstitious fears that appeared to have gripped the minds of the public, about the "harmful effects" of consuming food during an eclipse. These baseless fears about the eclipse, and the imagined scares about "unknown harmful rays and gases" emanating from the Sun during an eclipse formed part of the lively discussion between the scientists, science popularisers of BGVS and the public. The IIA team had Ravinder Banyal, Edwin Ebenezer, P. K. Mahesh, and the visiting American students Sarah Willis and Thomas A. Schad.

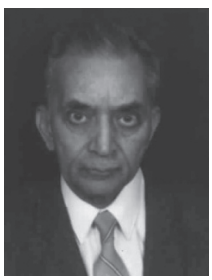
- Edwin Ebenezer

राजभाषा नीति के कार्यान्वय की दिशा में उत्कृष्ट निष्पादन हेतु पुरस्कार

28 जुलाई 2009 को भारतीय पशु चिकित्सा संस्थान, बेंगलूर में आयोजित नगर राजभाषा कार्यान्वयन समिति बैठक में वर्ष 2008-09 के लिए आयोजित राजभाषा चल वैजयंती प्रतियोगिता में हमारे संस्थान को राजभाषा नीति के कार्यान्वय की दिशा में उत्कृष्ट निष्पादन हेतु चतुर्थ पुरस्कार प्रदान किया गया।

पुरस्कार प्राप्त करते हुए संस्थान के प्रोफेसर एच सी भट्ट, डीन ए, प्रोफेसर आर सी कपूर, सलाहकार व डॉ एस एन महेश, अनुभाग अधिकारी (हिन्दी)

Obituary



With profound sadness, we announce the passing away of our former colleague, solar physicist and atmospheric scientist B.N. Bhargava, on the 3rd August, 2009 at New Delhi. Professor Bhargava was born on December 25, 1919 at Sadabad, Uttar Pradesh. After Master's in Science from Allahabad University in 1943, another in Electrical and Communicating Engineering from the Ohio State University, USA in 1947, and a short stint at the Central Radio Propagation Laboratory, Washington DC, USA, he joined the Kodaikanal Observatory in 1949, to lead the work of the Magnetic and Ionospheric Station. He rose to the position of Assistant Director of the Observatory in 1960. In 1965 left to assume charge as the Director of Colaba and Alibag Observatories in Bombay. He was the Director of the Indian Institute of Geomagnetism, Bombay from 1971 till his retirement in 1979. During his tenure at the Kodaikanal Observatory, he contributed significantly to a co-ordinated solar, ionospheric and geomagnetic research there. An ionospheric laboratory with a multi-frequency automatic sounder, electronics laboratory and radio astronomy section were established, which resulted in excellent quality of magnetic and ionospheric data. A Fellow of the Indian Academy of Sciences, B. N. Bhargava was a pioneer of radio astronomy research in India. He built the first radio interferometer at 100MHz for observations of Sun at the observatory in 1952, which was the only radio telescope in India until the Kalyan telescope was built in 1966 by TIFR. Prof.Bhargava also initiated measurements of Faraday rotation of satellite signals through the ionosphere at the Observatory. Prof. Bhargava leaves behind his wife, daughter, son-in-law, son, daughter-in-law and grand children.

Retired

N. Damodaran, who served on IIA's support staff at the Vainu Bappu Observatory since 1993 retired on the 30th June, 2009.

N. Damodaran

K. Chinnappaian

K. Chinnappaian, who served on IIA's support staff at the Vainu Bappu Observatory since 1978, and Poombarandi Murugan, who served

Poombarandi Murugan

on IIA's support staff at the Kodaikanal Observatory since 1980, retired on the 31st July, 2009.

J. P. A. Samson

J. P. A. Samson and F. Gabriel who joined IIA in 1974, retired on the 31st August, 2009. Samson initially worked at the Kodaikanal observatory, and then moved to the Bangalore campus. He served both the photonics and mechanical divisions, and brought his broad-based technical expertise to a variety of areas including optical and mechanical aspects of the Vainu Bappu Telescope, the Himalayan Chandra Telescope, and the development of various other in-house facilities. He was deeply involved in setting up an observatory at Calicut University. He also made outstanding contributions to IIA's outreach efforts, being a hands-on participant and the gentle communicator in innumerable sky-watching events.

F. Gabriel

F.Gabriel served the Vainu Bappu Observatory for all the 35 years of his career. Besides his involvement in setting up facilties including the Vainu Bappu Telescope there, he was also involved in the Hanle and Kodaikanal Observatories, and in BARC's Gamma Ray Telescope facility at Gulmarg. Though with no formal training, he brought a high level of skill to his work, and devoted his life to the Vainu Bappu Observatory.

New Appointments

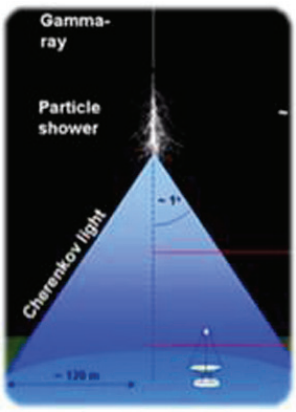
IIA welcomes.....

.... *S. N. Mahesh*, who joined IIA as the Hindi Officer, in June, 2009. Mahesh obtained a Masters Degree in Hindi in the year 2000, when he topped Bangalore University and secured three gold medals. Before joining IIA, he worked for six years as the Hindi translator in the Centre for Artificial Intelligence and Robotics of the Defence Research & Development Organisation, Bangalore. He obtained his Ph.D. in Hindi from Bangalore University in 2006, on the topic, Doctor Paramlal Gupt Ke Kathasahitya Main Parilakshit Samaajik Yatharth Bodh (Social Reality in the works of Dr. Paramlal Gupt). He loves to write, and in his spare time he enjoys travelling and reading.

... *M. V. Ramaswamy*, who joined IIA as a Civil Engineer. Ramaswamy has a masters in Water Resource Engineering from the University Visvesvaraya College of Engineering, Bangalore. Subsequent to his graduation in the year 2000, he worked for the Karnataka Government as a technical manager at the Karnataka Urban Infrastructure Development Finance Corporation in Mangalore for three years, and between 2003-2009, he worked for the Indian Statistical Institute, Bangalore, as the civil engineer in charge of their engineering unit. Ramaswamy is a member of the Institution of Engineers, India.

....*Rajendra Bahadur Singh*, who had already worked on IIA's NLST project since 2007 as a research trainee, and has joined the permanent staff of the project in August. Rajendra got a Masters in Physics from Kanpur University in 2006. He has been involved in the site-characterisation effort of NLST, including instrumentation development, data reduction programming and observations. Rajendra has already been to the Merak and Hanle sites seven times where he has done both instrument installation and observations. He loves his visits to the sites, and also enjoys cooking in his spare time.

...Amit Pathak, who joined IIA as a post-doctoral fellow in July 2009 to primarily work with Jayant Murthy on the World Space Observatory project. Amit got his masters and PhD degrees from Gorakhpur university. His PhD research involved simulating the spectra of Polycyclic Aromatic Hydrocarbons in astrophysics and correlating the results with observations. Subsequent to his PhD, during 2006-08, he worked with E. Arunan of the Department of Inorganic and Physical Chemistry in the Indian Institute of Science, on formation of PAHs, soot formation, etc. He then spent a year as a post-doctoral fellow at the Chemistry department of Nottingham Univerisity, UK, before joining IIA. Amit is a cricket buff and enjoys reading fiction in his spare time.



Kodai Winter School on High Energy Astrophysics

IIA together with the Institute of Mathematical Sciences, Chennai, will hold an International School on High Energy Astrophysics at the Kodaikanal Observatory, IIA, during 1st-11th, December, 2009. Diverse areas such as particle physics, neutrino physics, cosmic rays, gamma-ray astronomy, instrumentation, data analysis and the new Indian initiatives will be covered. The school is aimed at final year Masters' and beginning-level PhD students.

http://www.iiap.res.in/kodai_he09

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.

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