IIA Newsletter

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In this issue...

From the Director's desk

The Parliamentary Standing Committee on Science and Technology, Environment and Forests, with the Hon'ble Shree P. G. Narayanan as its Chairman, visited the Institute on June 25, 2007, along with 12 Hon'ble Members belonging to the Upper and Lower Houses of the Indian Parliament. Three officials of the Rajya Sabha Secretariat and representatives of the Department of Science & Technology accompanied them. Senior members of the IIA Faculty joined me at the Hosakote campus in welcoming the MPs. I made a presentation on the activities of the Institute as well as on the current initiatives and future projects, which was webcast to the IAO, Hanle. This was followed by a live demonstration of the remote operations of the 2-m telescope. Professors Prabhu and Srinivasan, who were both in Hanle at that time, also participated in the meeting through video-conferencing, and explained respectively the features of the 2-m Himalayan Chandra Telescope and the High Altitude Gamma-ray Array (HAGAR). In the subsequent discussion, the MPs posed many questions on the wide-ranging activities of IIA including our efforts to share the excitement of astronomy with the general public. They were satisfied to hear of the several initiatives that the Institute has taken related to public outreach. The Committee also visited the M. G. K. Menon Laboratory for Space Sciences where a state-of-the-art clean room facility is being set up for testing and calibration of the ultraviolet imaging telescope (UVIT) payload.

HAGAR is now in its commissioning phase. With the severe Ladakh winter on the way out, work has started on laying the cables connecting the seven telescope units. Five of the seven units are fully operational and the remaining two will be commissioned by October. The Institute will host a national symposium on Gamma Ray Astronomy during November 2007.

In the third week of May, Professor Pati and I visited DFM Engineering Inc. in Longmont, Colorado where our 1.3-m telescope is being designed and fabricated. A comprehensive review of the design took place. The Differential Image Motion Monitoring (DIMM) telescope for continuous measurements on

the sky is nearly ready at the same workshop. The DIMM and the 1.3-m telescope will be delivered towards the end of 2007 and 2008 respectively.
On June 18 and 19, a design review of the proposed Hanle Echelle Spectro-Polarimeter (HESP) was held at IIA jointly with the Anglo-Australian Observatory (AAO) which will produce a Detailed Concept Report for the fabrication and supply of HESP. The design aspects of the instrument were reviewed through video-conferencing in which technical groups from AAO in Australia, Kiwistar Optics in New Zealand and IIA participated. The final design will be worked out in the next few months. The new instrument will be installed on the 2-m HCT at Hanle and will be part of a global network of telescopes for high-level spectroscopic cum polarimetric studies of stars.

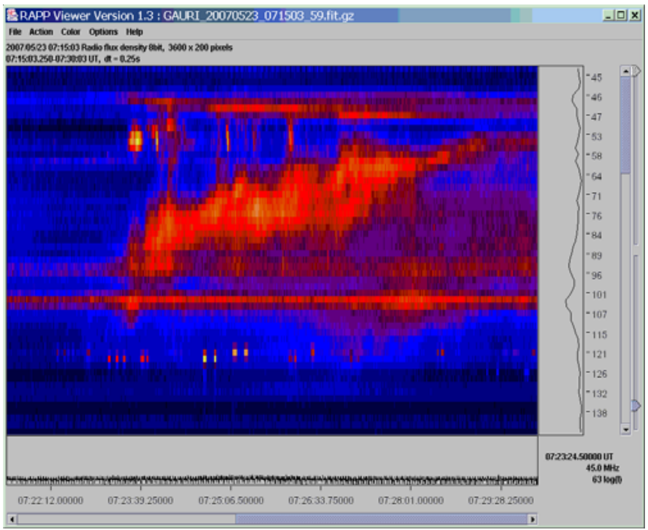
The Institute is currently running summer programmes in which many young people are taking part. Besides the regular Summer Students' Programme, we are proud to join from this year the IRES or International Research Experience for US Graduate Students Programme which is sponsored by the US National Science Foundation's (NSF) Office of International Science and Engineering (OISE). For the next three years, IIA will host American graduate students, exposing them to a vibrant research atmosphere in a premier Indian R & D institution. This year four students will spend six weeks carrying out research projects with IIA mentors. We are also conducting a Traineeship Programme in which large numbers of young graduates from several parts of the country are taking part. They will provide support to various IIA programmes such as the National Large Solar Telescope (NLST) project, UVIT and HAGAR.

Together with the Pennsylvania State University, IIA has organized a workshop on Astrostatistics and shall soon host in Kodaikanal the first Kodai-Trieste Workshop on Plasma Astrophysics jointly sponsored by IIA and ICTP, Trieste.

The forthcoming months will witness the commencement of several new projects and programmes. The present administration block, set up originally to temporarily house various sections of the Institute in the mid 1970s, will soon be replaced by a new multi-storeyed building at the same location. It will accommodate the administration, library, classrooms, project-related activity, staff, students etc and will be equipped with state-of-the-art facilities.

A New Spectrometer at Gauribidanur Observatory for Solar Radio Spectral Observations

It is planned to carry out co-ordinated radio spectral observations of the solar corona from various locations around the world during the International Heliophysical Year 2007 (IHY 2007) and beyond, with near-identical backend receiver systems (http://ihy2007.org). The idea is to understand the flare and coronal mass ejection (CME)-related transient radio events in the solar atmosphere and their association with disturbances in the interplanetary medium and the near-Earth space. In view of this, a log periodic dipole (LPD) antenna system with a gain ~ 8 dB and VSWR < 2 in the frequency range 30-1100 MHz has been set up at the Gauribidanur observatory, by the solar radio astronomy group. The characteristic impedance of the antenna is 50Ŭ. After amplification of ~ 45 dB by a wideband amplifier (kept near the antenna base), the RF signal is transmitted to the receiver building via a coaxial cable of length ~ 100 m, buried ~ 1 m below the ground level. The attenuation in the cable is ~ 1 dB at 40 MHz & 8 dB at 1000 MHz. The CALLISTO (Compound Astronomical Low frequency Low cost Instrument for Spectroscopy and Transportable Observatory) spectrometer (e-C03 model) provided by ETH, Zürich is used as the backend receiver (www.astro.phys.ethz.ch/instrument/callisto/ecallisto/applidocs.htm).It has a detector sensitivity of 25mV/dB and the output from the aforementioned amplifier is directly fed to it. The channel resolution of the spectrometer is 62.5 kHz and the radiometric bandwidth is ~ 300 kHz. The sampling time is 1.25 ms per frequency-pixel and the integration time is ~ 1 ms. The frequency information (in MHz) and the detector output (in mV) are stored as an ASCII file in a PC through an RS-232 interface.



The CALLISTO-Gauribidanur spectrometer was commissioned on 7 December 2006 and regular observations are being carried out since then. The daily observing period is 02:30-11:30 UT (08:00-17:00 IST). The figure shows the dynamic spectrum of a type II radio burst (generated by electrons accelerated by flare-and/or CME-related magneto-hydrodynamic shocks) from the solar corona observed with the above instrument on 23 May 2007. Interestingly this is the first type II event to be observed during the IHY 2007 campaign from India. The abcissa and ordinate in the figure are time and frequency (MHz), respectively. The slowly drifting path of intense emission (both in time and frequency), from

96 MHz at 07:23 UT to 58 MHz at 07:28 UT, is the type II burst. The two horizontal patches of intense emission around 101 and 46 MHz are due to radio frequency interference. The instrument, along with other CALLISTOs at different longitudes around the world (http://www.astro.phys.ethz.ch/instrument/callisto/RFSPEC2/) is expected to provide round-the-clock coverage of the Sun.

- R. Ramesh

Diffuse Far-UV Radiation Field in the Galaxy

We are continuing with an analysis of FUSE (Far Ultraviolet Spectroscopic Explorer) observations of the diffuse far ultraviolet (FUV) radiation field. FUSE has routinely been used to observe point sources such as stars and has made outstanding contributions to many areas of astronomy through a study of individual objects. However, we have pioneered an innovative technique whereby we observe diffuse radiation through the FUSE LWRS (large aperture). Using purely serendipitous data, we have obtained several hundred observations spread over the entire sky.

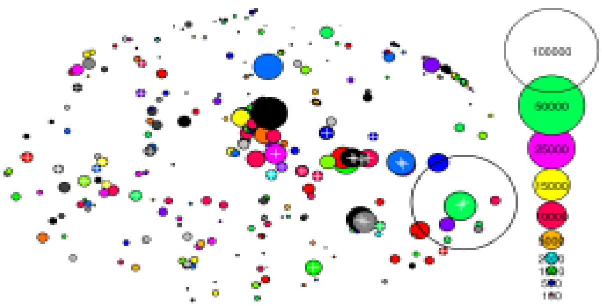


Fig. 1 Brightness of the radiation is shown by the radius of the circles.

Our most recent application of these data is to the Coalsack Nebula (Sujatha et al., ApJ., in press). Although well known as a dark patch against the bright disk of the Milky Way, easily noted with the naked eye, we have found the Coalsack to be one of the brightest patches of diffuse UV emission in the sky, seen just to the right of the Galactic Centre in Fig. 1.

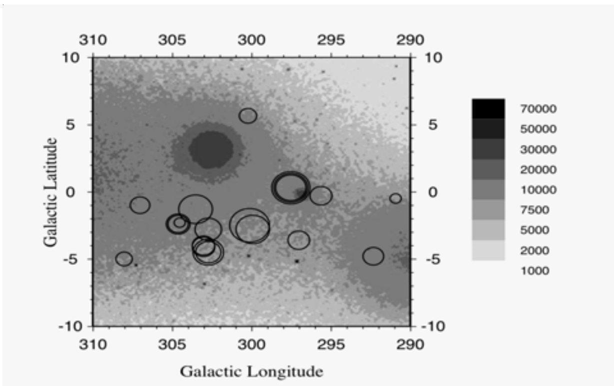


Fig. 4.— The scattered light predicted by our model with $a = 0.28$ and $g = 0.61$ is shown in figure in units of photons cm^{-2} s^{-1} sr^{-1} Å^{-1}. The observed locations are overplotted as circles whose radii are proportional to their intensity at 1114 Å.

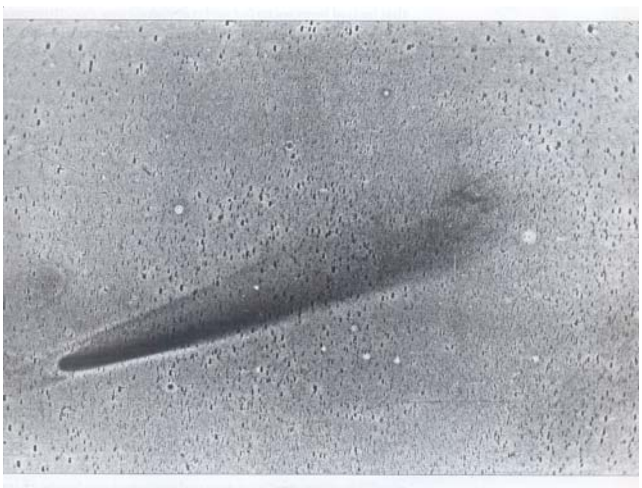
Using data from the FUSE archives as well as several of our own observations, we have modeled the expected radiation from the Coalsack (Fig. 2). We have found that although the Coalsack itself dominates the gas and dust in that direction, the diffuse UV emission is actually light from 3 of the brightest stars in the ultraviolet sky scattered by thin foreground clouds. This surprising result indicates that there is no simple relationship between the UV light scattered by interstellar dust and the actual amount of that dust. Instead, it can be a complex function of the relative positions of the dust patches and the bright stars.

We have used these data to predict the distribution of the scattered light near the Coalsack (Fig. 2) and have placed strong constraints of 0.28 \pm 0.04 on the albedo and 0.61 \pm 0.07 on the phase function asymmetry factor. These are amongst the first derivations of the scattering properties of interstellar dust grains in the far ultraviolet and show that the grains are quite dark and moderately forward scattering, in agreement with standard models of the grains.

- Jayant Murthy

The Great September Comet of 1882 II (C\1882 R1) that Transited over the Sun - Pogson's Observations from Madras Observatory

The great comet of 1882 (designated as C\1882 R1) was one of the most brilliant Sun-grazing comets of the nineteenth century that launched a major astronomical project 'Carte du ciel' of photographing the sky (Gingerich 1992, Ashbroock 1961). The huge post-perihelion tail was concave towards south and shaped like the tusk of an elephant. 'Observing the comet with the naked eye at the seaside the whole tail took an hour to rise', exclaimed Nursing Row (1882) from Vizagapatam on October 7, 1882. The comet had many firsts to its credit: one of them being the display of anti-tail (or Sunward tail).



The comet was independently discovered by several observers in the southern hemisphere.

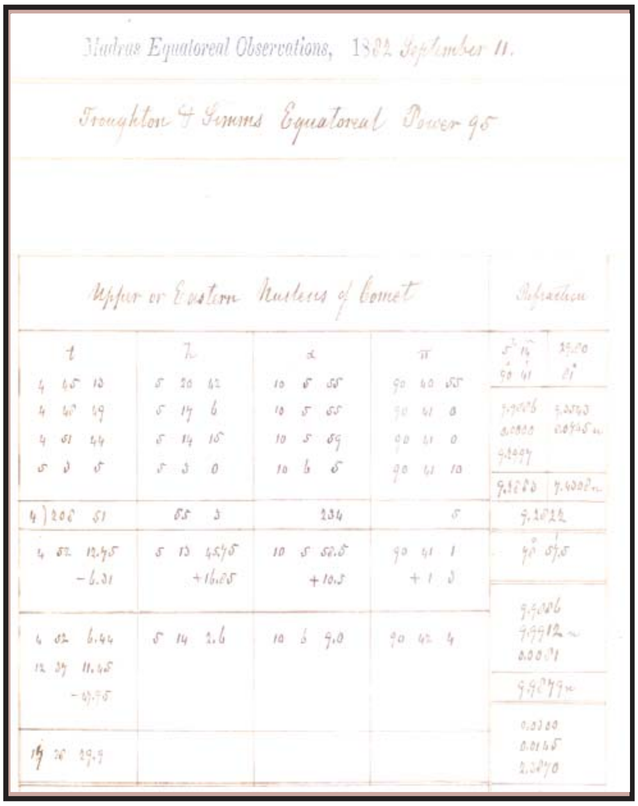
N. R. Pogson

Madras Observations:

The Madras observations were started by N. R. Pogson, then Director of Madras Observatory even before perihelion on 11th September 1882. Norman Robert Pogson was a well known observer, who established the magnitude scale that is used even today. He was a meticulous observer whose spectroscopic observations of the prominences at the 1868 total solar eclipse at Masulipatam contributed to the discovery of Helium.He had observed several comets earlier, a famous one being the rediscovery or recovery of the lost comet of Biela in 1872 (Pogson 1872).

Madras Observatory Building

Pogson used the 8-inch Troughton and Simms telescope for his observations. He started observing (may be independently) and measuring the position of the 'Upper or Eastern Nucleus' of the comet. Although no detailed account of the observations are available the above statement suggests that he observed more than one nucleus (the other nucleus being lower or western). He measured positions of the upper or eastern nucleus from September 11 onwards whenever the sky permitted him, using several comparison stars.These measurements (unpublished so far) are listed in the following table. On a few occasions he even gives the position of the end of the south tail (or long streak) and the centre of the end of the broad tail. (from which the length of the tail can be inferred). Sometimes he jots the length of the tail.


Madras Equatoreal Observations, 1882 September 11.

Troughton & Simms Equatoreal Power 95

Upper or Eastern Nucleus of Comet

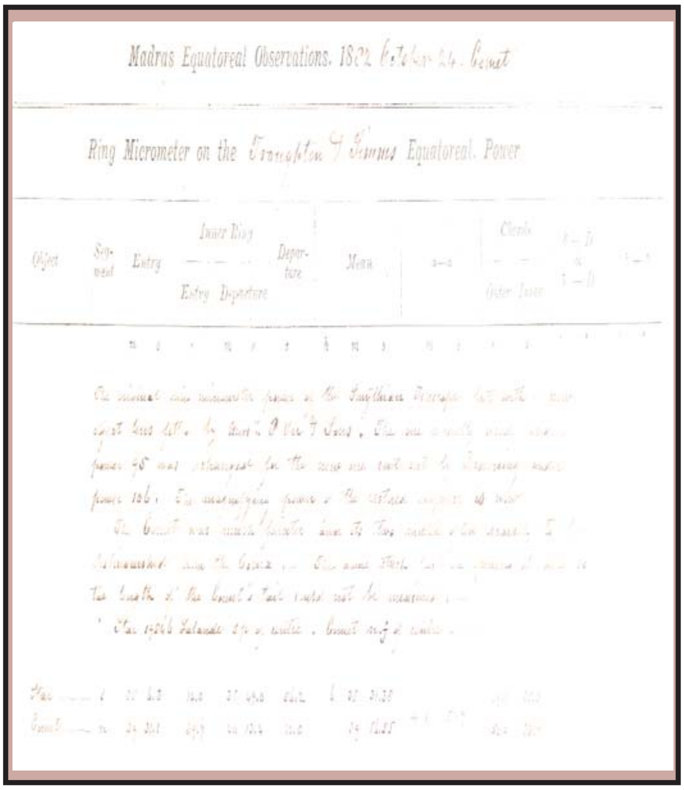
Sample data sheet of September 11, 1882

Table 1. Measurement of positions of the upper nucleus of the comet 1882

Date	L.S.T	L.M.T	R.A	N.P.D
	h m s	h m s	h m s	0 ' "
Sep				
11	4 52 6.44	17 28 29.9	10 06 9.0	90 42 04
16				
23	5 28 35.4	17 17 42.2	10 58 14.3	92 54 22
24	5 55 55.7	17 41 2.1	10 54 06.8	90 33 51
25	5 27 55.4	17 09 10.5	10 51 54.3	94 08 32
26	5 48 22.2	17 25 38.0	10 49 31.0	94 41 35
27	5 37 49.2	17 11 10.9	10 46 59.1	95 14 45.5
30	5 36 42.1	16 58 16.1	10 40 28.0	96 33 30
Oct				
4	5 43 5.9	16 48 55.3	10 33 21.05	98 44 04
8	6 29 25.7	17 19 23.9	10 28 43.6	100 28 43
16	6 06 1.75	16 24 36.5	10 17 51.4	104 00 6.5
17	6 51 31.3		10 1 29.8	
19	7 4 56			
24	6 54 39.5	(he did not fully reduce them)		

The observations cover up to November 1, 1882. On October 24, he comments that the comet was much fainter and its two nuclei often scarcely to be distinguished from the Coma and the dome stuck fast on opening it and the length of the comet's tail could not be measured. He clearly saw two nuclei.

The observations stopped after November 1. Pogson recorded that It was known that some comets split after perihelion.

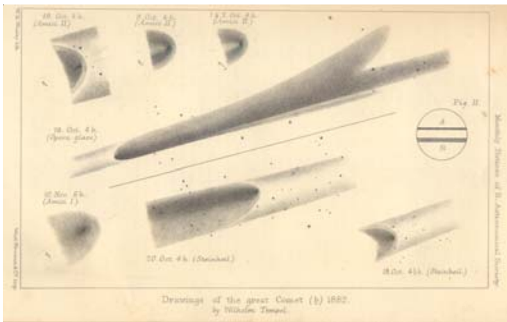

Madras Equatoreal Observations. 1882 October 24. Comet

Ring Micrometer on the Troughton & Simms Equatoreal. Power

Data sheet of October 24, 1882

The Puzzle:

Pogson's records suggest that the Great Comet 1882 II had split even before perihelion. However David Gill of the Cape Observatory strongly asserts that it is not the case (Gill 1883). Writing in MNRAS Gill states, 'In reply to the question which you ask on behalf of the Society viz. whether before perihelion the Great Comet of 1882 showed a duplex or compound nucleus, the observations recorded by Mr. Finlay and Dr. Elkin on September 7 and 8 and printed in Monthly Notices prove clearly that no duplicity could be detected with our optical means on these dates. Dr. Elkin describes the nucleus as sharp, well defined disk 10" or 15" in diameter as strongly condensed in the centre. A short glimpse I obtained confirmed the view. ... ... weather was unfavourable till 17th, the day on which the disappearance of the comet on the sun's limb has been noted the nucleus was certainly single on that day'. Gill asserts that till September 28th the nucleus was single. However on September 30th the nucleus is seen to be split. It was remarked by Finlay there seems to be two balls of light in the head (of the comet). Drawings by Temple (1883) do show two bright nuclei on October 1 and 2.



Temple's drawings

Several observers had noticed multiple nuclei after 1st of October.

Regarding Pogson's observation: could the geographical separation between Madras and Cape Town offer a different line of sight to the comet displaying a different perspective? At a distance of 0.5 a.u a cometary object of 10 km can provide a disk of 8" that could in principle provide different facets to geographical locations separated by 6400 km. Could this be the probable cause? Pogson did not publish his observations. He also did not reduce some of these observations. The picture could have been clarified if drawings of the comet by him could be traced but none have been found.

Tailpiece:

Regarding the appearance of Comet 1882II Nursing Row (1883) mentions that 'Our Hindoo astronomers predicted the appearance of a comet in the southern hemisphere in their printed calendar for the present year. ... ... no other particulars except that it would possess a bright copper colour like the rising moon and a long tail. The name given to their predicted comet is Silpacam'.

References:

Ashbrook, J. 1961, Sky & Tel. 22, 331.
Gill, D. 1883, MNRAS, 43, 318.
Gingerich, O. 1992, ' The Great Copernican chase' Sky Publishing Corporation, Cambridge and Cambridge University press , p 189.
Nursing Row , 1883, MNRAS, 43, 32.
Pogson, N.R. 1872, MNRAS, 33, 116.

- N Kameswara Rao, A Vagiswari, C Birdie

Dr C. Muthumariappan and **Dr Firoza Sutaria** have joined IIA as Readers on May 14 and 21, 2007 respectively. Dr Muthumariappan is posted in Kavalur while Dr Sutaria is in the main campus in Bangalore.

Dr P. K. Das, Reader and **Shri C. Nanje Gowda**, Technical Officer, retired from service March 31, 2007 on attaining the age of superannuation.

P. S. Mumtaj Aleem
(1949 - 2007)

With deep sorrow, we mourn the untimely passing away of P.S. Mumtaj Aleem on June 1, 2007, after a massive heart attack. Mumtaj Aleem was a native of Periyakulam, a town at the foot of the Kodaikanal Hills, where his mortal remains were buried in the presence of hundreds of people including his relatives, colleagues and a large circle of friends, who had gathered to pay their last respects to the departed soul. Aleem leaves behind his wife, son and his family, an unmarried daughter and his aged mother.

Mumtaj Aleem was born on July 4, 1949. He obtained a Bachelor's degree in science in 1969 from the University of Madras and joined the Solar Division at the Kodaikanal Observatory in December 1970 as a Scientific Assistant. He soon proved himself to be a very skillful observer, like his father, the late Shahul Hameed, a very venerable person who served as an important observer at the Spectroheliograph at the Kodaikanal Observatory for over 30 years of the last century. Like his father, Aleem too spent all his service years at the Kodaikanal Observatory campus. He had inherited all the skills and qualities of an adept observer from his father. At the time of his death, Mumtaj Aleem was a Scientific Officer SD.

Aleem was a member of the IIA team in all the solar eclipse expeditions undertaken by the institute within India. He was also an active observer of Comet Halley during its apparition in 1985-86 and obtained some of the best images of the comet. As a senior staff member he provided organizational support in the day-to-day running of the Observatory as well as for many conferences and summer schools held on the Observatory campus. He was an integral part of the Observatory itself. Aleem was an extremely pleasant person, very popular with all his colleagues as well as with the community at large in the township of Kodaikanal. As a Rotarian, he rendered selfless service to implement many social service schemes in Kodaikanal. For the past 4-5 years, Aleem had not been keeping very good health for his age, particularly after a cardiac surgery.But this did not deter him in the least from giving his best and contributing his services with great devotion to IIA, whether in scientific work or in organizational responsibilities or social work within the community. He worked for the preparations of the Summer School in phyiscs currently in progress at the Observatory campus (June 4 - 23, 2007), literally till his very last breath. The end came quite unexpectedly while he was directing operations within the campus for the Summer School.

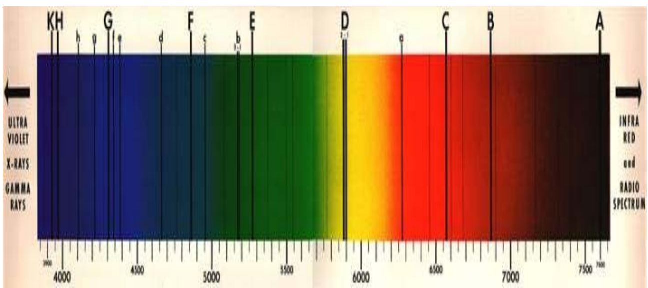
Aleem will be best remembered as a good solar observer, as a loving father and grandfather, a beloved husband, a devoted son and a loving brother by his family and as a person who cared for the well being of all his friends alike and of everyone who he came into contact with. We in IIA pray that his soul may rest in peace.

- K. R. Sivaraman

International Heliophysical Year (IHY) - Education & Public Outreach Programme

The International Heliophysical Year (IHY) is a United Nations programme spread over the years 2007 and 2008. It was formally launched on February 19, 2007 at the Unispace meeting in Vienna. The main objective of the programme is to develop the basic science of heliophysics (the connections between the Earth, the Sun and the interplanetary space) through cross-disciplinary studies of universal processes, to foster present and future international scientific cooperation in the study of heliophysical phenomena, and to communicate the unique results of the International Heliophysical Year to the scientific community and the general public. Education and Public Outreach form a major component of the programme. It is hoped that through the Education and Public Outreach Programme the knowledge on Heliospheric Physics will be disseminated to the general public and will inspire the next generation of space scientists who are still in schools and universities.

Scientists at the Indian Institute of Astrophysics have come up with the concept design of three simple experiments to study the Sun in the visible and radio wavelengths. The prototypes are being currently fabricated and tested in the workshop and laboratories of IIA. After this phase is completed, IIA will take the initiative of organising the production of these instruments in adequate numbers and supply them to schools and colleges throughout the country. The concept design and use of the optical kits are described here.

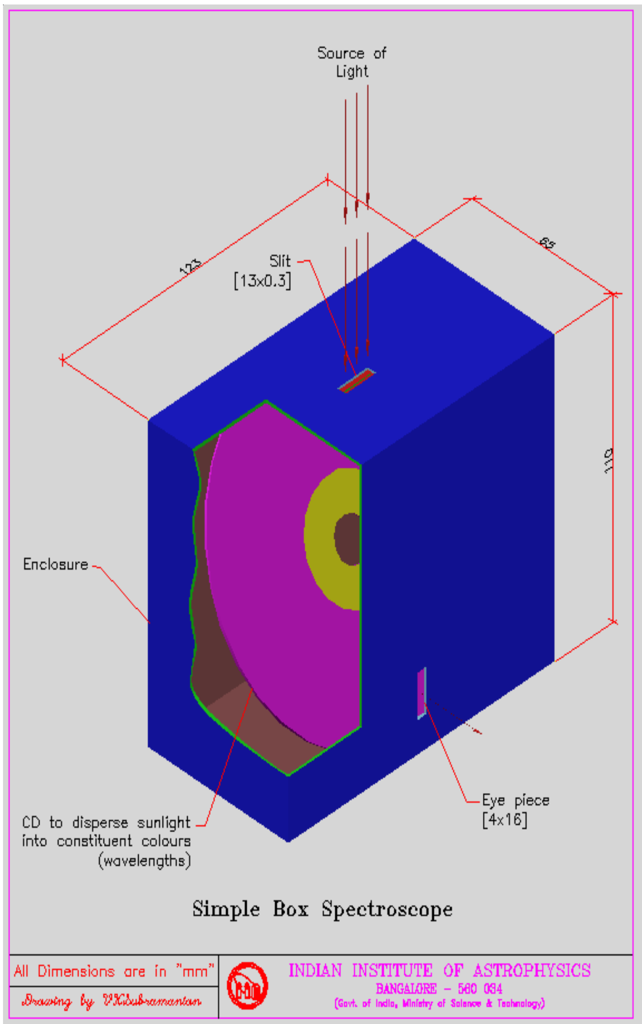


A sample solar spectrum can be seen in the above figure. Dark lines are superposed on the continuous spectrum of the Sun. The dark lines in the spectrum arise due to the relatively cool gas in the solar atmosphere absorbing the light that comes from a greater depth inside the Sun. These lines are fingerprints of the elements present in the atmosphere of the Sun. The spectrum also reveals other information like the temperature, the pressure and the velocity of the layers where the lines are formed.

School level experiment to study Sun in Optical wavelengths

Simple spectroscopes can be constructed to view the spectrum of the Sun. One can find numerous designs in the published literature and on the internet.One such design was adopted to make a simple box type spectroscope for students to view the solar spectrum on the National Science Day. A diagram showing the complete construction of the box spectroscope is shown below. The simple equipment became an instant hit with the students.

A Box Spectroscope



The box may be constructed out of a thick card board or an aluminium sheet. One slit (of width nearly 0.2-0.5mm) is made in one of the faces of the box through which light is sent. It could be either sunlight or fluorescent light or light from a sodium lamp. Inside the box is a commercially available CD. The light gets diffracted by the CD (the CD acts as a reflection grating) which is kept at an angle of nearly 60 degrees and the spectrum can be viewed through the other view port opening on another side of the box.

This is one of those do-it-yourself science experiments which anyone can enjoy doing. Sources like common tube lights in the house or a sodium lamp in the street give bright lines at specific locations superimposed on a continuous background of colors.

75mm Achromat Solar Imager Telescope

The proposed 75mm Achromat Solar Imager telescope is an improved version of the 75mm Refractor Telescope designed and produced for the Halley's Comet watch during 1985-86 jointly by IIA and CSIO, Chandigarh. The telescope has equatorial mount with provisions for setting the local latitude angle, leveling the mount and tracking of the objects with motorised drive unit. A special attachment to project the solar image on a screen for safe viewing of Sun's image and a flip mirror arrangement to feed a simple spectroscope for viewing solar spectrum or an eye-piece for night sky watch are the added features of this telescope. A large image of about 125mm to 150mm diameter Sun's disc can be projected on the screen which facilitate one to view the sunspots clearly and study the day-to-day variation of the sunspots, their position and size. These details can also be recorded by marking on a graph sheet regularly to study and understand the movements of sunspots.

Specfications

1. Objective	: 75mm diameter Achromat, Cemented Doublet
2. Focal Length	: 874mm
3. F ratio	: f/11.7
4. System magnification	: 35X with 25mm Ramsden eye piece
5. Mount	: Equatorial with Motorised RA Drive
6. Image size on the Screen	: 125mm

A diagram showing the complete experimental setup is shown in Figure 1.

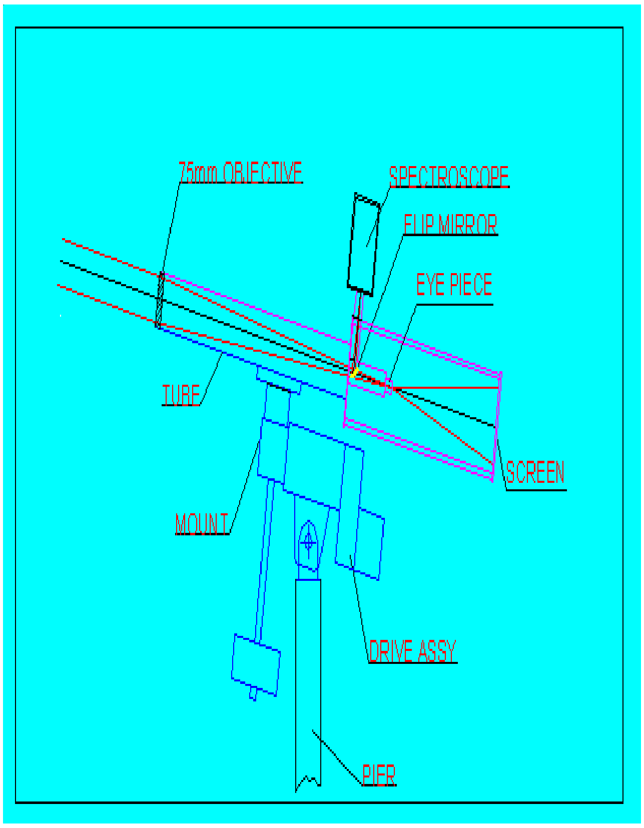


Figure 1

All the components used in this experiment are inexpensive except for the optics and the tracking motor, and gear system. All components are available within the country. The estimated cost is around Rs.20,000. School teachers will be given initial training to install, maintain and use the equipment.

College level experiments to study Sun in Optical wavelengths

For the college level, a coelostat solar telescope with two plane mirrors of 6 inch size is proposed. The first mirror tracks the Sun and puts the light on to a second mirror. The first mirror is on an equatorial mount and hence needs the first time adjustment that depends on the latitude of the place. From the second, a parallel beam of light is divided in to two parts, one going to the imaging unit and the other to the spectrograph. The imaging unit has a field lens and a magnifier lens to get a 10-12 inch image of the Sun. Students can put a graph paper and trace the sunspots daily to get the rotation of the Sun.

Students at college level may not be satisfied with visual studies alone. They may like to record and analyze the spectrum. A focusing lens before the spectrograph slit focuses any part of the Sun on to the slit. A collimating lens is kept at the other side of the slit and a reflecting grating disperses the light. A lens focuses the dispersed spectrum on to a CCD camera. The camera sends the digitized data to a computer and stores it. The digital spectral data can be analyzed for the velocity fields, abundance of elements and activities on Sun. For example, recording a spectral line at the east and west limb of the Sun can give the rotational velocity of the Sun. The optical arrangement is shown in the Figure 2. A continuous interaction between IIA and the colleges is envisaged by which training and planning new experiments will take place.

Amateur Astronomy CCD cameras have become less expensive and affordable. They cost around Rs.25,000 per system. System software is a one time investment. Computer programmes to analyze the data can be developed by the students themselves. The tracking has to be better and hence the total cost of this system including the computer may be around Rs.100,000.

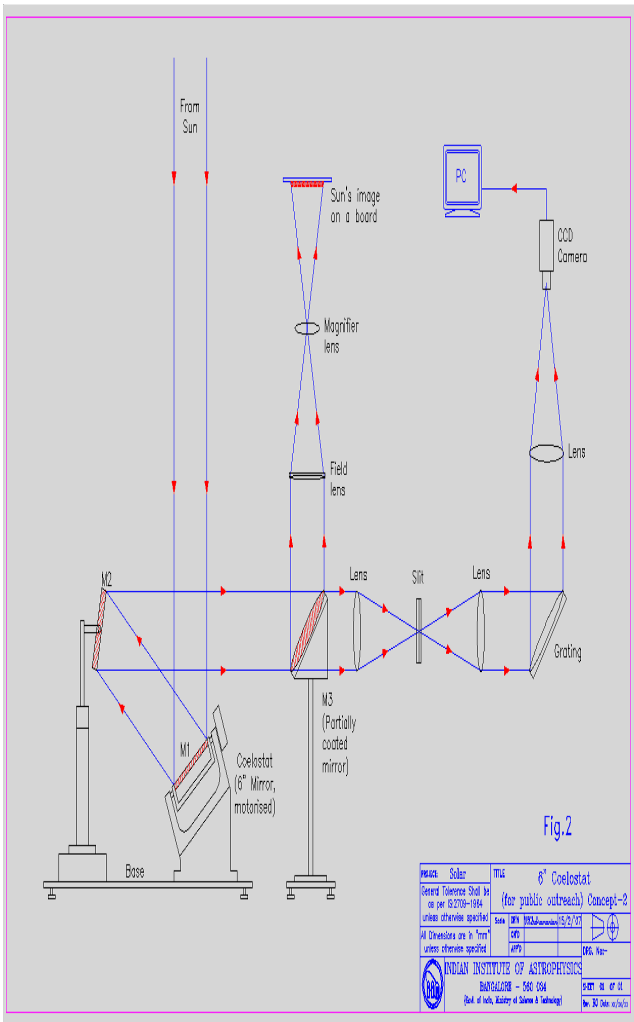


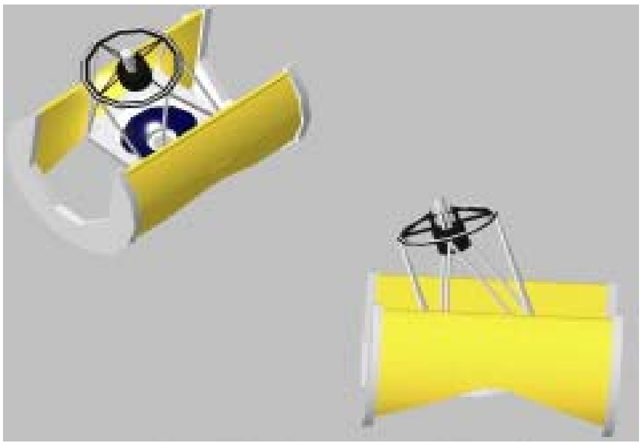
Figure 2

- K. E. Rangarajan, K. B. Ramesh, J. P. A. Samson, P. K. Mahesh, P. U. Kamath, K. C. Tulasidharan

A 1.3-m telescope for the Vainu Bappu Observatory

The Vainu Bappu Observatory in Kavalur will acquire a 1.3-m telescope in 2008. IIA has contracted out its design and fabrication to DFM Engineering Inc., in Longmont, Colorado. DFM Engineering, Inc. enjoys a great reputation for building small- to moderate-sized optical telescopes, having manufactured and installed over 70 such astronomical telescopes worldwide, of which more than half a dozen are of the 1-m class. Some time ago they were awarded a contract for a 1.3-m telescope by ARIES in Nainital.

The observational programmes planned to be carried out at the telescope include imaging of comets, planets, star clusters, galaxies and clusters of galaxies and moderate resolution spectroscopy and polarimetry of astronomical sources. To start with, the telescope will be equipped with a 4K x 4K CCD imager with a complement of broad-band and narrow-band filters. Facility for standard U,B,V,R,I filter photometry as well as for narrow-band imaging with half-power bandwidth of 1 to 20 nanometers in selected spectral lines (e.g., at 373 nm, 486 nm, 500 nm, 656 nm), will be provided at installation. There is also a plan for doing low-to-intermediate resolution spectroscopy(R = 500 to 2000), imaging polarimetry and near-IR imaging in J,H,K bands. While the imaging CCD system is being developed at IIA's electronics laboratory, planning of the spectrograph has not yet evolved beyond the concept level. Perhaps a fibre-fed multi-object instrument would be the ideal one to serve the needs of our astronomers.



Model of the proposed telescope

The low latitude of Kavalur (12 degrees 34 minutes North), has necessitated a redesign of the polar axis structure of DFM Engineering's regular 1.3-m equatorial telescope, generally meant for higher absolute geographical latitudes. The new telescope is going to have an equatorial mounting configuration consisting of a double horse-shoe mount.

In IIA's original proposal, the following desirable features were specified for the optical system of the telescope:

(1) a clear aperture of at least 1 metre.
(2) a Cassegrain focus as the preferred observing configuration.
(3) an unvignetted field of at least 30 arc minutes with an image scale allowing adequate sampling of astronomical 'seeing' in the range 0.5 to 1.5 seconds of arc.

In keeping with these requirements, it has been agreed upon to have an F/8 Cassegrain system with a minimum of 30 arc minutes of corrected field. It is anticipated that the telescope will be able to do imaging photometry to an accuracy of 1% for a star of visual magnitude 20 when the seeing is about 0.7 seconds of arc. The telescope will have an arrangement which provides for X, Y, Tip, Tilt and Focus movements of the secondary mirror. The proposed double horseshoe mount is large enough to support a 1.5-m instrument clearance. The diameter to thickness ratio of the primary mirror will be approximately 8.

Optical Design Summary:

* 1.3-m aperture Ritchey-Chrétien configuration;
* Fused silica field corrector provides 10.52-m focal length and a corrected flat field of 30 arc-minutes;
* White light images >75% ensquared energy in 15 micron (0.3-arc second) pixel;
* R-C focus without corrector has greater than 55% ensquared energy in 0.6 arc-second pixel over the 30 arc-minute field;
* Primary mirror is F/2.5, Secondary mirror is 400 mm in diameter.

Telescope mount features:

* Equatorial Double Horse Shoe mount for 12 degrees 34 minutes latitude;
* Hydrostatic polar axle bearings - zero friction, high stiffness;
* Ball bearing Declination bearings;
* 5-Axes focus housing with computer control and absolute encoders;
* Slew speed of 3 degrees/second in both axes;
* Tracking rates from 0 to +/- slew speed with a velocity resolution of 0.001 arc seconds per second;
* Telescope Control System with external computer interfaces;
* 1.5-m instrument clearance;
* 150-kg mass instrument load.

The contract for the telescope was signed in June 2006 at Longmont, Colorado by Professor Siraj Hasan. The delivery time indicated on the contract was 30 months with several reviews in between. A detailed design reviewwas held in May 2007 in Longmont in the presence of Professors Hasan and Ashok Pati.

A steering committee in IIA chaired by Ashok Pati oversees the telescope project. Its other members are H.C. Bhatt, Sunetra Giridhar, D.C.V. Mallik, A.K. Saxena, and R. Srinivasan.

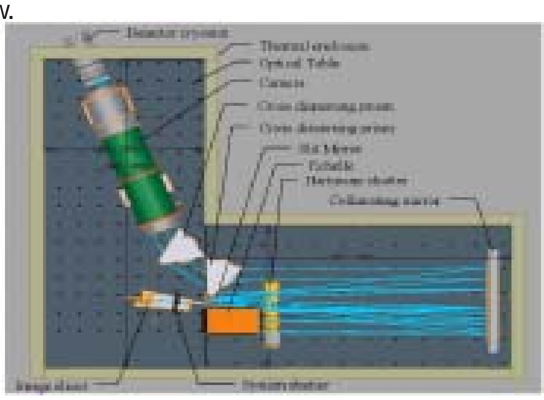
- D. C. V. Mallik

Hanle Echelle Spectro-Polarimeter (HESP)

The Himalayan Chandra Telescope (HCT) at the Indian Astronomical Observatory (IAO), Hanle is operated remotely from Bangalore using a dedicated communication network. IIA plans to equip HCT with a high-resolution echelle spectro-polarimeter that can also be used as a spectrometer, as and when required. The design goals include a wide spectral coverage from 370 nm to 900 nm in a single CCD frame with a resolving power of 60,000. With the help of two optical fibres simultaneous record of a star and sky or a star and a calibration source can be obtained. In the polarimetric mode, the two fibres will allow a simultaneous measurement of both the orthogonal components of a given polarization state on the same CCD frame. In this mode the wavelength dependence of linear and/or circular polarization can be measured at the same high resolution. As per the design the spectrograph mounted on a bench will be fed by the double optical fibres from a Cassegrain interface which will contain both calibration facilities and the optional optical components for polarization measurements. It is hoped that this arrangement would result in an extremely good mechanical stability with minimal instrumental polarization.

The spectro-polarimeter will allow astronomers to investigate a large number of interesting problems in stellar atmospheric and structural studies, including problems in asteroseismology, star-spots, distribution of magnetic fields across stellar disks, circumstellar environments of pre-main sequence stars and of highly evolved stars. The instrument will also be used in studies of cosmochronology and of detection of exo-solar planets.

The Anglo-Australian Observatory (AAO) together with Kiwistar Optics and Prime Optics were assigned the task of producing a concept design of the instrument. The proposed optical design is outlined in the figure below.



In a review held recently in Bangalore, where representatives of AAO and the science and technical teams of IIA were present, various aspects of the design were analysed including the functional and performance requirements of the instrument, keeping in mind the operational conditions of HCT. The mechanical design, the electronics and the software configurations were discussed in detail. Some suggestions were made for optimizing the performance of the instrument. A technical collaboration between IIA and AAO is envisaged for the building of this instrument.

- Sunitra Giridhar

Report on IAU Symposium 241

The IAU symposium 241 on “Stellar populations as building blocks of Galaxies” was held during the period, December 10-16, 2006 in La Palma; a picturesque small island of the Canary Islands, Spain. The main aim of the conference was to consolidate the present understanding of stellar populations, and their role to gain more insights into larger structures: galaxies.

The weeklong conference attracted a large number of astrophysicists, around 190, both observers and theorists with research interests ranging from structure and evolution of single stars to large stellar systems, e.g., star clusters and galaxies. Conference discussions were partitioned into six sessions: model ingredients (evolutionary models, spectral libraries, IMF); stellar population models (theory); stellar populations in the Milky Way (observations); stellar populations in the Local Group: populations in early-type and late-type galaxies; extragalactic globular clusters; new observing facilities. Each of the sessions were followed by review talks given by invited speakers. The conference began with a discussion on the current status of stellar evolutionary models and a review of stellar synthetic libraries by Bengt Gustafsson. Pavel Kroupa summarised the different forms of the IMF of different populations, and concluded that the IMF is uniform, and can be well represented by a power-law with the Salpeter index for masses above 0.5M Sun. Abundance ratios in our Galaxy, and the Local Group galaxies were reviewed by Tolstoy who showed that the chemical history of our Galaxy differs from the chemical history of dwarf spheroidal galaxies. From IIA, Eswar Reddy attended the conference and presented results from their survey of abundances of individual stars in the Milky Way that he has conducted with his collaborators. These results were widely discussed in the conference for the larger sample size, uniformity, accuracies, and the constraints they imposed on theoretical modeling of stellar populations and in understanding the chemical evolution of the Milky Way. Organisers arranged a daylong trip to the observatory which houses some of the best telescopes in the world like WHT, INT and the new 10.4 the Gran Telescopio CANARIAS(GTC).

Finally, Bland-Hawthorn from Austria talked about future propspects and stressed the importance of wide-field adaptive optics systems on the 8-10 m class telescopes, and the prospects of JWST and ELT which may provide significant gains over existing systems. The scientific discussions will be published under the title “Stellar Populations as building blocks of galaxies” in the series IAU symposia and will be edited by Alexandre Vazdekis and Reynier Peletier.

- B. E. Reddy

International Research Experience for US Graduate Students (IRES) Programme

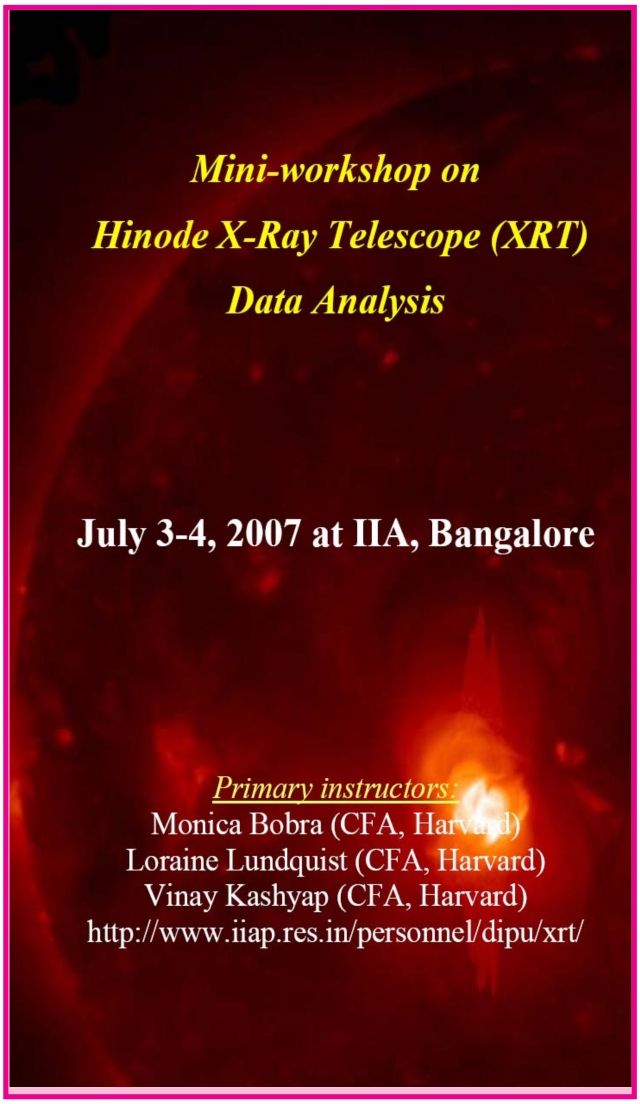
The US National Science Foundation (NSF)’s Office of International Science and Engineering (OISE) sponsors a summer overseas programme for graduate students with good academic standing currently registered in US universities. The main goal of the programme is to expose potential researchers to an international setting at an early stage in their career and to provide them with good research experience. The programme is only open to US citizens. IIA has been identified as the foreign host institution in Astronomy and Astrophysics to conduct this programme for three years starting in June 2007. The programme supports full-time summer research positions for 8 weeks.

Four students have been slected this year in the programme in IIA, which started on June 16, 2007. During their stay in India, the students will work on research projects in close collaboration with IIA scientists identified as staff mentors for the specific projects. The activities will also include a number of social events and travel to field stations, and interactions with other IIA staff, affiliates, and visitors. At the end of the programme, the participating students are supposed to submit a detailed report on the results of their research projects, and a report on their observations and thoughts concerning their research, living and travel experience in India.

From left to right Annapurni Subramaniam, Kiran Jain, S. S. Hasan, Sarah Sonnett, Natalie Hinkel, Russell Stoneback, Nicholas Moskovitz.

Further details of this programme are available on the web site http://eo.nso.edu/ires.

- Annapurni Subramaniam



The IIA-Penn State Astrostatistics School

2-7 July, 2007

Vainu Bappu Observatory,

Kavalur

http://www.iiap.res.in/astrostat/index.html

Popular Articles in Local Press

C. Sivaram: Starry-eyed Surprise - SN 1987A (20 yrs)in Science & Technology, Deccan Herald, Bangalore March 27, 2007.

K. E. Rangarajan: Sun takes centre stage in Science & Technology, Deccan Herald, Bangalore April 17, 2007.

C. Sivaram: Earthy Exoplanets in Science & Technology, Deccan Herald, Bangalore May 8, 2007.

IIA Exhibition Stall at VITM, Bangalore

(Courtesy: T. K. Muralidas)

1st Asia-Pacific School on International Heliophysical Year

The International Heliophysical Year (IHY) is an international program of scientific collaboration planned for 2007, the fiftieth anniversary of International Geophysical Year (IGY) and extending through 2008. To address IHY's focus on providing unique opportunities for the global community to increase the visibility and accessibility of heliophysics outreach programme, the IHY International steering committee has formed the IHY Schools Program with the purpose of educating students about Universal Processes and providing them with an opportunity to view their own interests in a new context. By enhancing the scope, impact and outreach of existing space physics programs at various host locations, the IHY schools will enable student cultural exchange with the goal of establishing innovative new models for graduate education and training in heliophysics. Morever, the schools will provide fertile grounds for collaborative research in this field and will facilitate the development of a diverse, globally-engaged scientific community that recognizes the increasing relevance of heliophysics.

Dates: *10 - 22 December, 2007*

Venue: *Kodaikanal Observatory, Indian Institute of Astrophysics*

Convenor: *K. E. Rangarajan*

Editors: D. Banerjee, D.C.V. Mallik, B. A. Varghese

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