IIA Newsletter

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In this issue...

Founder's Day

This year the Founder's Day was observed in Bangalore on Monday, August 11, 2008. Professor C N R Rao, Linus Pauling Research Professor and Honorary President, Jawaharlal Nehru Centre for Advanced Scientific Research, Bangalore, delivered the Founder's Day Lecture. Professor Siraj Hasan presided over the function.

'Doing Science in India : Personal Reflections' – C N R Rao, FRS

Professor C N R Rao began his lecture by paying tribute to the late Professor M K Vainu Bappu, the founder of IIA, who he knew well and had interacted closely with during the annual meetings of the Indian Academy of Sciences. He said Bappu was a quiet scholar and a fine human being. He stood for excellence. Coming to the theme of his lecture, Professor Rao reminded the audience that he chose this general topic since it addressed the common profession of the audience and the speaker. 'We all do science'. He remembered 1947, the year India got her freedom and he was still a student in Bangalore. Celebrations were spontaneous and everywhere. The speeches by Jawaharlal Nehru and Sarvepalli Radhakrishnan were inspirational. Prime Minister Nehru was an ardent supporter of science and genuinely believed that development based on scientific and technological progress was good for mankind and for India, in particular. Under Nehru's leadership, India came to be the first country whose government actually formulated a Science Policy and it was passed by the Parliament in 1958. Professor Rao referred to Homi Bhabha's close proximity to Nehru and how at Bhabha's instance, the Indian Atomic Energy Commission and the Department of Atomic Energy were established with Bhabha at the helm of both.

There were great scientist-leaders in the country. Sir J C Ghosh, Professor Rao's teacher and Director of the Indian Institute of Science then, was called upon to head the first Indian Institute of Technology in Kharagpur. A large contingent of young researchers from IISc followed him to Kharagpur. The tradition of pursuing science had started even earlier with Sir J C Bose, who was essentially a nineteenth century man. Bose invented the first radio

receiver but was denied due credit for it. Professor Rao referred to a paper in the *Notes and Records of the Royal Society* which clearly established the fact that Bose was the first to develop a microwave radio receiver. He felt Bose was cheated, he deserved to be our first Nobel Laureate and Marconi should have shared the prize with him. J C Bose was the teacher of S N Bose and M N Saha, and then there were C V Raman and Ramanujan. All these people were great scientists in their individual capacities. But at the time of independence there was no great scientific institution in the country. When Professor Rao returned to IISc in 1959 after his doctorate and a post-doctoral tenure in Berkeley, he found that his department had minimal facilities. But the young scientists pursued their research with great devotion choosing problems that could be done with the modest equipment available. The gap between the scientific achievements of the country and those of the west was mainly due to the gap in the facilities. Yet some quality science was produced in the country.

Thirty years ago, when Professor Rao and Dr Rais Ahmed of the University Grants Commission conducted a national survey, they discovered that almost 60% of scientific research originated in the universities, in spite of the fact that universities lacked funds and facilities. Around the same time, under Indira Gandhi's leadership, a National Committee for Science and Technology was set up of which Professor Rao was a member. It recommended an increase in funding to the science and technology institutions. It also recommended funding of research of some individual scientists of great calibre, like the noted biologist G N Ramachandran. Money started flowing in but the quality of the institutions did not improve up to the expectations. Professor Rao rued the fact that in spite of help from the government over the years, we have not been able to create a single institution in this country to match the quality of Harvard University or Berkeley or Cambridge. He recalled Blackett's famous definition of a great institution being one, where ordinary people were able to do extraordinary things. Unfortunately, it did not happen in India, all institutions remained mediocre at best and produced mediocre work. Institutions like the IITs produced first-rate students but they all went abroad after obtaining their degrees and did not serve the country. Not one engineer from the IITs joined either our Space Programme or the Atomic Energy Programme. It is the second-rate and more mediocre people who stayed on in the country and took up research as a career. Both Atomic Energy and the Space establishments have been filled with these people. The gap in quality was thus never bridged. The funding of educational institutions continued to be poor. During Rajiv Gandhi's tenure, a National Commission for Education was set up of which Professor Rao was a member along with Professor M G K Menon and they wrote very strongly in their recommendations that the funding to the universities had to be substantially increased. P V Narasimha Rao, the Minister of Education at the time, chaired the Commission. He agreed with the recommendations of the scientists but later, when he became the Prime Minister, he did little to improve the funding. Universities, therefore, continued to suffer. Today universities contribute less than 15% to the total research output of the country, a very unhappy situation. Professor Rao mentioned that in the 1950s, the total research student strength in the universities in U.P. was close to 1500. Today that number has dwindled, with only 150 students enrolled for research in Benares Hindu University. Professor Rao blamed it on poor funding, lack of infrastructural facilities and an increase in political activities in the universities.

Moving on to the more recent times, post-2000, Professor Rao saw a further decline in both the quantity and quality of scientific research. He said of the total volume of research produced today, the United States and Europe share almost an equal amount. Asia in totality is also close to these two 'pillars' but India's contribution to the 'Asian pillar' is rather small, China being the major contributor. The research output of this country has stayed at the same level for the last several years, while that of the other Asian countries has gone up and thus, in comparison, Indian research appears to show a decline. Unlike the era of Raman, Saha or Bose, today there are hardly any top class scientists in any field in the country. Just like in the Olympics, we are far behind. Our best are not good enough when compared with the best in the rest of the world. In 2007, China produced 16,000 Ph.D.s, the USA 23,000 but India produced only 4,000 Ph.D.s. Actually, this number has not gone up since the 1960s. According to Professor Rao, India can no longer call herself a developing country or an under-developed one. Today she has to compete with the best on equal terms and therefore, quality has to be the yardstick. In a study conducted by David King of Britain about two years

ago, it was shown that when the top 1% of the scientific publications in the world were considered, 63% of it came from the United States, more than 20% from Europe (an upward swing of several per cent compared to the post-War figures) but the Indian contribution was as low as 0.5%. China too was low some years ago, but today it is close to 2% and growing. The two areas, where India seems to have made a large investment in research and claims to be doing well, are Advanced Materials and Biology, but even in these areas China appears to be far ahead. In fact, going by the citations, the Chinese contribution to research in the area of Advanced Materials is the highest in the world. Professor Rao posed the question is there a country that is doing well in technology without doing well in science ? His answer was a categorical 'no'. Good technology implied a solid base in good science. The United States and Japan are great examples, he said. Further, science has to be supported for its own sake, not just because it may lead to good technological growth. Professor Rao felt that our investment in science is still not enough. A city-state like Singapore and a small country like Taiwan have made much bigger investments in science and have built impressive scientific infrastructure. India has done very little. According to him, the phenomenal growth of science in People's Republic of China is mainly due to the close co-operation that exists between China and Taiwan. The former has gained a lot in the process.

In India, another change has taken place which has done harm to science. Rise of information technology with its offer of more lucrative jobs has taken the young people away from science. Nowhere is this trend more apparent than in Bangalore. Referring to the large population of software engineers working in the IT industry in Bangalore, Professor Rao said Bangalore has the biggest concentration of brainless young people. Very few among the youth in Bangalore or Hyderabad (the other city dominated by IT industry) come forward to do research. Most of the research students that he comes across these days, come from interior parts of Tamilnadu or Andhra Pradesh, a large number come from West Bengal and also Bihar but not one from the societies where IT dominates. He was critical of the fact that people here do not seem to value scholarship any more. He was horrified to think of a IT-dominated society without scholars, historians, philosophers, economists and musicians. He said – the rise of IT has killed the growth of science. Ironically, the funding of science has improved by orders of magnitude in the last few years, just when there are hardly any people coming forward to practise it. Finding the right people is a big challenge today. If such people are found, they have to be protected from jobs and temptations of money in the IT sector. One had to search far and wide for such people, in schools, colleges, wherever. Professor Rao mentioned some initiatives that are being taken in this direction. The government too is taking new initiatives. New structures are being created with the establishment of more IITs, creation of IISERs, implementation of new funding mechanisms along the lines of the National Science Foundation in the United States. Although it would take a very long time to improve the conditions in the universities, there are serious efforts to do so. There is thus some hope that things will turn for the better. Professor Rao averred that creativity in science depends upon 'crazy guys' with great ideas, who do not care about public opinion but pursue those ideas with single-minded intensity and publish 'nutty' papers. They are non-conformists by nature. We seem to be lacking such people. IT produces only conformists. There is a great need for creative minds. He said creativity cannot be taught but an environment can be created where it can be nurtured and that is the task ahead. Much has changed since the time when people did good work with little money. The amount of money going into science has increased 300 percent this year. But he feared, often the first casualty of too much money is creativity.

Professor Rao felt that for an individual scientist to produce quality science there has to be in the mind a fear of failure and an anxiety for success. Somehow this seems to be missing. It is harder to do good research today than it was in the years when Professor Rao had started his career. The volume of research worldwide has increased enormously and the competition has become much fiercer. According to him, the choice of a good research problem is a very important component of producing quality research. Mindless repetition of work done elsewhere with some superficial modification will never lead to good science.Many of India's brilliant scientists fail to attract the attention they deserve, because they do not choose the right problem to work on. He cited molecular biology as one of the fields where this is strikingly apparent. Professor Rao said good science can only be produced through hard work. He also said excellence has no benchmark, it is like the Enlightenment of the Buddha, one has to seek and find it. The goal of an individual should not be a prize or an award, it has to be

something much higher. Ending on a hopeful note, he said India is a young nation with 54% of its population being less than 25 years of age. Most of the country's talent remains untapped in the minor towns and villages. Even if urban India looks away from science, we have this vast resource to fill our science laboratories and universities and this huge unutilised talent should be brought into the science mainstream to create a knowledge base and this will make India the knowledge centre of the world.

Founder's Day at the Vainu Bappu Observatory

The 81st birth anniversary of Professor M K Vainu Bappu was celebrated at VBO on August 10 & 11, 2008. On Sunday, August 10, 2008, Professor Bappu's photograph was garlanded in the presence of the VBO staff and short commemorative speeches were delivered by P. Anbazhagan and C. Muthumariappan.

A special programme was organised for students of the nearby colleges on Monday, August 11, 2008, where Professor C Sivaram, Chairman, Theoretical Astrophysics Group, IIA, was the Chief Guest. A total of 60 people (10 physics students and 2 lecturers from each of five colleges) participated in the programme. Some staff members from VBO also attended.

P. Anbazhagan welcomed the gathering. Professor Sivaram then delivered two lectures, one on 'Sun, Stars and the Universe' and another on 'Astrobiology' with a tea break in between. Lunch was organised for all the participants in the Dining Hall. In the afternoon Dr Muthumariappan spoke on 'The Universe seen with big eyes'. A film titled 'Cosmic collisions', produced by the American Museum of Natural History, was screened for the audience. The participants had an opportunity to ask questions and interact with the scientists. This was followed by a visit to the observing facilities on campus. Dr Muthumariappan led the group assisted by the observing section staff. The programme generated a great deal of interest in astronomy among the visiting students and they spent the lunch and tea

breaks discussing various topics in astronomy with the scientists. Concluding remarks and a vote of thanks were given by Dr Muthumariappan. The function was held at the new lecture hall.

- C. Muthumariappan

Solar Coronal Rotation from X-ray Bright Points Observed with Hinode / XRT and Yohkoh / SXT

The Sun rotates differentially (i.e. the equatorial regions rotate faster than the polar regions) at the photosphere and chromosphere. Measurements of solar rotation have been carried out by two methods: (i) the tracer method — tracing the passage of various features like sunspots, faculae, filaments etc., over the solar disc, and (ii) the Doppler method — by the spectroscopic observations of Doppler displacements of the core of the spectral lines. The phenomenon of solar rotation is still to be understood clearly from the existing large volumes of data. On the other hand, coronal rotation is observed through features like [Fe XIV] green lines, soft X-rays, and radio waves. Coronal rotation has been measured also by two methods: (i) the tracer method — based on visual tracing of coronal features in consecutive images and (ii) the automatic method, that relies on the IDL procedure "regions of interest" segmentation that is used to identify and follow them in the consecutive images. However, both the methods have advantages and disadvantages. The coronal rotation determination appears to be more complicated and even less understood, because the corona is optically thin across a wide range of observed wavelengths, and the features are less distinct in duration and extent. Determination of the coronal rotation using X-ray bright points (XBPs) as tracers is an interesting and important problem. There are many applications of XBPs to understand the solar corona, namely, (i) intensity oscillations and heating of the solar corona (Kariyappa and Varghese, 2008); (ii) coronal rotation (Kariyappa, 2008); (iii) contribution of XBPs to total solar X-ray irradiance variability (Kariyappa, DeLuca, Saar and Farid, 2008) and (iv) detection of meridianal motion in the corona (DeLuca, Kariyappa,

Saar, Golub and Reeves, 2008). It has been shown by various groups that the solar corona rotates differentially on the basis of their analysis of coronal bright points in SOHO/EIT images. However, further investigations are required to confirm the differential rotation of the corona from long based observations of XBPs. In particular, it is not clear that the sidereal angular rotation velocity of the corona depends on the sizes and lifetimes of the tracers (XBPs) and how it varies with the phases of the solar cycle.

Daily full-disc soft X-ray images have been used from the period of January, March, and April 2007, obtained from the X-Ray Telescope (XRT) on board the Hinode mission. The images were observed through a single X-ray Ti_poly filter, and the image size is 2048"x2048" with a spatial resolution of 1.032"/pixel. In addition, the multiple observing sequences of the Yohkoh/SXT full-frame images selected for 3-months each year from 1992 to 2001 were used for the analysis. In both data sets, a large number of XBPs, covering a large range of latitudes, have been identified and selected over the whole solar disc for a detailed analysis. The main criterion for identifying an XBP was to check its persistence in the consecutive images at approximately the same latitude and shifted in the central meridian distance (CMD) according to the elapsed time. The CMD values of the identified features were then measured in selected consecutive images and were fitted as a function of time. The correlation coefficient of the function CMD was generally very high, implying that the tracers were correctly identified. Using SSW in IDL, the full-disc maps of the images have been generated and overlaid with longitude and latitude grid maps.

In using the tracer method (based on a visual identification of a particular XBP that can be used as a tracer), coronal X-ray bright points are visually traced in consecutive images on a computer screen. This was carried out several times to make sure that the same XBP has been monitored. The rotation velocities were determined by a linear least-squares fit of CMD as a function of time, and more images were used to determine the velocity of each XBP. A large number of rotation velocities have been measured for different possible CMDs in each latitude band, so that more data points were used in the analysis. In addition to sidereal angular rotation velocities, the sizes of XBPs have also been measured. The sidereal angular rotational velocity values are compared with the latitude and sizes of the XBPs.

In Fig.1, the variation of sidereal angular rotation velocity as a function of latitude is shown for Hinode/XRT data. It is clearly seen that the corona rotates differentially like the photosphere and the chromosphere. In addition to the sidereal angular rotation velocity of XBPs, the sizes of all the XBPs have been measured in full-disc images observed from Yohkoh/SXT for the time interval from 1992 to 2001.

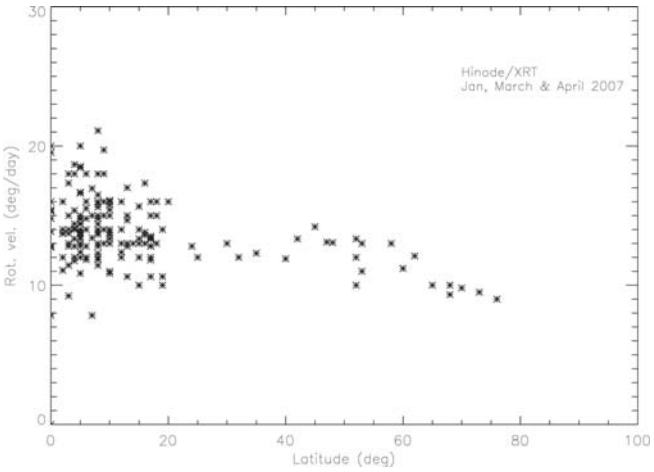


Figure 1: Coronal sidereal angular rotation velocity as a function of latitude to demonstrate that the corona rotates differentially. The rotation velocity has been measured with the help of XBPs as tracers from Hinode/XRT full-disc images of January, March, and April 2007.

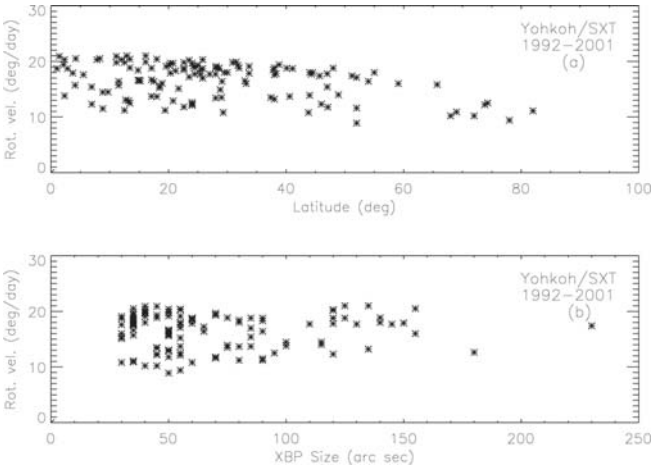


Figure 2: Coronal sidereal angular rotation velocity is compared with (a) latitude and (b) sizes of the XBPs derived from the images of Yohkoh/SXT for the time interval from 1992 to 2001.

A plot of the sidereal angular rotation velocity as a function of latitude is shown in Fig.2(a) and as a function of sizes of the XBPs in Fig.2(b). The correlation coefficient between the sidereal angular rotation velocity and the sizes of XBPs is found to be 0.065. It is evident from Fig.2 that the coronal sidereal angular rotation velocity does not depend on the sizes of XBPs. The life span and variations in the sidereal angular rotation velocity of some of the XBPs are examined from the collection and it is found that the sidereal angular rotation velocity values appear to not change with their lifetime. This means that the long- and short-

lived XBPs show almost the same rotational velocity. In contrast, Golub and Vaiana (1978) have shown from their preliminary analysis that the rotation rate of long-lived X-ray features is equal to that of sunspots while the rotation rate of the short-lived X-ray features is consistent with that of the photospheric gas. However, the coronal sidereal angular rotation velocity does not depend on the sizes of XBPs, and it is difficult to extrapolate the relationship between the photospheric rotational velocity and the sizes of sunspot groups to the coronal level.

From a detailed analysis of daily full-disc X-ray images obtained using the Hinode/XRT and Yohkoh/SXT experiments, it can be concluded that the coronal X-ray bright points are good tracers to determine the angular rotation velocity of the corona. It is found that the corona rotates differentially as do the photosphere and the chromosphere. The coronal sidereal angular rotation velocity does not depend on the sizes of XBPs, and differential rotation is present throughout the solar cycle. The results do not reveal any strong evidence of the dependence of the angular rotation velocity on the solar magnetic cycle. A full description of the work may be found in Kariyappa, R. 2008, A&A **488**, 297.

References:

DeLuca, E. E., Kariyappa, R., Saar, S., Golub, L, & Reeves, K. 2008, in preparation.
Golub, L. & Vaiana, G. S. 1978, ApJL **219**, L55.
Kariyappa, R. & Varghese, B. A., 2008, A&A **485**, 289.
Kariyappa, R., DeLuca, E. E., Saar, S. & Farid, S., 2008, in preparation.

— R. Kariyappa

Experimental Physics Lab for Integrated PhD Students

Doing science does not mean knowing scientific facts alone. It means understanding the process of how science actually works. It also means understanding how the rigour of scientific methods is applied to advance a new hypothesis, the design of a meaningful experiment, the importance of systematic and careful observations, evaluating the credibility of the evidence and finally the formulation of a theory or law that reflects and explains the regularity and symmetry in nature. However, the chief purpose of a graduate level laboratory course is not to investigate or examine a new hypothesis. Usually, the goal of such a course is to conduct experiments so as to test and verify the well known physical laws and theories in the laboratory. Students therefore, can develop necessary experimental skills and also consolidate their understanding of fundamental ideas and concepts of modern physics.

The first batch of integrated PhD students in IIA will carry out about ten general physics experiments. These experiments are carefully selected to cover the important areas of basic physics. Apart from the measurements of important physical quantities, experiments also involve the determination of one or the other fundamental constant of nature. Examples include: the measurement of universal gravitational constant with Cavendish's torsion balance, determination of the Planck's constant from photoelectric effect and blackbody radiation spectrum, the measurement of speed of light using Foucault rotating mirror technique, electronic charge from Millikan's oil drop experiment, e/m ratio using Coulomb's constant from electrostatics, verification of Faraday's law etc.

These classic experiments also mark important milestones in the advancement of physics during the last century. With all the available resources, students have the parallel opportunity to explore the historical significance of landmark discoveries and important breakthroughs in physics, and also learn about the distinguished scientists whose contribution markedly changed the scientific landscape of our time. Most importantly, it helps them refine their understanding of the complexity and ingenuity of great experiments in the evolution and the development of scientific ideas.

Students adjusting the torsion balance to measure the universal gravitational constant

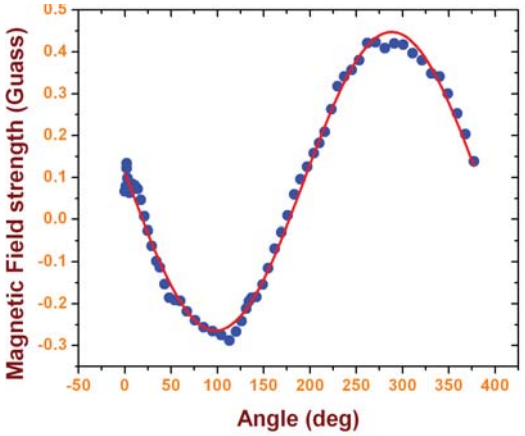


Figure 1 Earth's magnetic field measurements (in horizontal plane) in the general physics lab using Hall probe

At the component level, each experimental module (supplier: Pasco Scientific, USA) is designed with simple, open and detachable parts. This way, students can greatly appreciate the functionality of each component, quickly assemble the experiment and make a suitable modification in its parts if desired. This is essential to avoid the passive learning in a 'black-box' kind of approach to experiments, where the interior of the instrument often remains a complete mystery to the students.

Each experiment requires equipment setting, device calibration and fine adjustments before the actual measurements are made. Most of the experiments also have computer interface for instrument control, data acquisition and analysis, making the measurements more reliable, fast and accurate. After analyzing the experimental data, students have to estimate the physical parameters of interest, derive meaningful inference from the measured data, identify and evaluate the experimental uncertainties and then present the written report of the final results. While doing experiments, students are encouraged to initiate open discussions, and also actively participate in interactive sessions and tutorials classes.

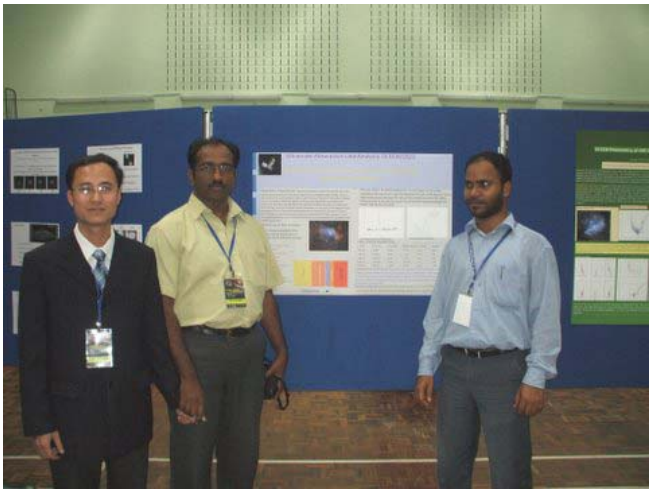
This general physics lab is open to all interested academic staff and students of IIA. Anyone who missed the thrill of doing these experiments in his/her college days is welcome to discover the "seriousness and fun" of it once again!

- Ravinder Banyal

The 9th COSPAR Capacity-building Workshop

Jayant Murthy and Prajval Shastri lectured at the Commission for Space Research (COSPAR) Capacity-building Workshop on Space, Optical and UV Astronomy, which was held in Kualalampur, Malaysia, during June 1 - 14, 2008 (http://www.angkasa.gov.my/cospar2008). Participants were students of Physics/Astrophysics from different countries of Asia and South-east Asia, and included Ananta Charan Pradhan, a Ph.D. student from IIA.

This was the 9th in the series of capacity-building workshops, organised by COSPAR and was co-sponsored by the National Space Agency of Malaysia, the Malaysian Ministry of Science, Technology and Innovation, the National University of Malaysia, the International Astronomical Union and the United Nations Office for Outer Space Affairs. Jayant Murthy gave four lectures on the topics Optical and UV Astronomy from Space, GALEX, FUSE and ASTROSAT. Prajval Shastri gave two lectures on Galaxies and Black Holes and conducted a session on writing a Hubble Space Telescope proposal. The workshop laid a heavy emphasis on the participants doing small research projects whose primary component was analysis of space-based astrophysical data. Jayant Murthy supervised projects on UV Emission from Pulsars, GALEX and XMM observations of M31, The Host of the Active Galaxy NGC1068, and UV Surface Photometry of Nearby Galaxies. Prajval Shastri supervised a project on Correlation between NIR and Radio Core Luminosity of Fanaroff-Riley-I Galaxies. Ananta Charan Pradhan did a project on OVI lines in Hot Star Spectra, under the supervision of David Boyce (Leicester University, UK).



Despite the varied backgrounds of the participants, the lectures did manage to give them an exposure to various astrophysical topics. The participants made presentations of the results from their projects at the end of the workshop. These projects were clearly the most highly valued component of the workshop.

Jayant Murthy also delivered a public lecture on The Search for Extra-Terrestrial Intelligence at the University Technology MARA, Shah Alam, Selangor.

- Prajval Shastri

IHY – Radio kit

The first IHY radio kit, was handed over by the Director, Professor Siraj Hasan to the students of Mohanlal Sukhadia University, Udaipur in a simple function held in IIA, Bangalore on August 27, 2008. The equipment is a two-element radio interferometer operating at 170 MHz, suitable for studying the Sun and other strongly emitting cosmic radio sources.The readers are referred to the September 2007 issue (Volume 12, No.3) of the IIA Newsletter for more details on the radio kit.

The Head of the Department of Physics of the MLS University had written to Professor Hasan, requesting for the equipment for use in their M.Sc. programme. The request was supported by the Dean, Faculty of Sciences of the University. The MLS University was joined by the Rajasthan Technical University, also in Udaipur, as a partner, to share the equipment for the latter's engineering students to learn radio astronomy. Students of both the universities were with us during August 24 – 29, 2008 and were trained by Dr R. Ramesh and his team at IIA's Gauribidanur Radio Observatory, on how to install and use the equipment. They learnt the basics of radio interferometry in the process. They also carried out observations of the Sun and Cygnus A with the equipment during their stay in Gauribidanur. We wish them the very best for the successful installation of the antenna and the receiver system at their institution with the hope that they will be able to carry out meaningful radio observations of astronomical sources with it.

– R. Ramesh

Claude Nicollier at IIA

Dr Claude Nicollier, a former NASA astronaut and currently, a professor at École Polytechnique Fédérale de Lausanne, Switzerland, visited IIA on August 12, 2008 and gave a scintillating talk, titled 'My Experiences in Space', to a packed auditorium. In the talk, he described in detail the Hubble Space Telescope and his own encounter with it in space when he was a member of the second Hubble Mission in 1999. This team managed to restore successfully the optical capability of the multi-billion dollar instrument. As he said 'Failure was not an option'. Dr Nicollier's presentation was filled with a large number of breathtaking photographs taken from space, among them some Earth scenes including the snow-capped Himalayas, the Mediterranean Sea and the Nile.

Dr. Nicollier visited the IIA Archives and was happy to see the rich collection on display.

The Second IIA-PennState Astrostatistics School

The second IIA-PennState Astrostatistics school was held at VBO, Kavalur during July 9 to 16, 2008.

The practice of modern empirical astrophysics involves a two-pronged challenge because of the compelling need for rigour in the application of the state-of-the-art statistical methods on one hand, and the recent paradigm shift that involves routine mining of large multi-wavelength datasets on the other, which requires complex automated analytical processes that invoke a very diverse set of statistical techniques. The IIA-PennState Astrostatistics schools are a response to this challenge. As with the first school in 2007, this school too was designed to meet this challenge by providing a strong conceptual foundation in modern statistics as well as a repertoire of the state-of-the-art statistical tools applicable to astrophysical problems.

These schools are distinctive as they are a part of a collaborative effort between IIA, the Center for Astrostatistics of Pennsylvania State University, USA, and the Indian statistical community, which was begun with last year's school. From the response to the IIA-PennState school last year, it was clear that the need for such a school in India is a very pressing one.

The school was open to astrophysics practitioners at all levels. While the first IIA-PennState School in 2007 was restricted to affiliates of Indian institutions, this year the school was international. There were a total of 31 participants that included four members from IIA, six from the Indian university sector (two faculty and four Ph.D. students), besides those from other astrophysics research institutes of the country, viz., IISc, RRI, ISAC, PRL, TIFR and IUCAA, and abroad. In terms of background twenty were graduate students including four from overseas institutions, viz., Tel-Aviv University (Israel), Max-Planck Institute of Astrophysics (Germany), and University of Geneva (Switzerland). There were three post-doctoral fellows and eight tenured scientists/faculty.

Besides Jogesh Babu of the Center for Astrostatistics, PennState University, USA, the resource persons of the school were Rahul Roy (Indian Statistical Institute, Delhi), Bhamidi V. Rao (Indian Statistical Institute, Kolkata), Sushama Bendre (University of Hyderabad), Mohan Delampady (Indian Statistical Institute, Bangalore), Thriyambakam Krishnan (Cranes Software International, Bangalore) and Arnab Chakraborty (Statistical Consultant, Kolkata). Apart from lectures on modern statistical concepts, a heavy emphasis was placed on lab sessions that demonstrated the use of statistical tools appropriate to astrophysical problems. Astrophysical data sets for the tutorials were compiled primarily by Eric Feigelson of the Center for Astrostatistics, PennState. For the purposes of these sessions, Anbazhagan Poobalan and his computer management team at the Vainu Bappu Observatory set up 32 multi-platform laptops in the lecture hall with the R software installed, and networked them to a local data-server. R is an open-source, multi-platform software environment, which is the current standard in research-level statistical computation. The tutorial sessions were conducted by Arnab Chakraborty.

A new feature of this school was the introduction of the topic of Time-Series Analysis, which was done by Arnab Chakraborty. Another new feature of the school was that special brainstorming sessions were organised for participants to present a description of their own on-going research problems to the statisticians. Those participants who made use of this feature, then presented a summary of their problems and the inputs from the statisticians, to the whole school.

Prior knowledge of statistics was not a pre-requisite for the course. As many participants observed, it had an optimum blend of commonly used prescriptive methods and their theoretical foundation, which would help them in their future research, particularly in their choice of statistical tools. This was also evident in the particpants' questions during the sessions and afterward, and during the participants' presentations on their research problems.

The tranquil venue of the Vainu Bappu Observatory greatly facilitated the intense engagement that was demanded of the school. Apart from the pedagogical activity, the coming together of astrophysicists and statisticians reinforced once more the very real need for further collaborations between the communities. Although the dates of the school were selected to coincide with the lull-period in observing activity, the participants and statisticians did have an opportunity to do sky-watching during the post-dinner hours.

The statistics lectures were brought out in the form of Lecture Notes, hard copies of which were made available to the participants at the start of the school. The website of the school is being maintained, and all the lecture notes as well as the tutorials and data sets are available on the website (www.iiap.res.in/astrostat).

The assiduous team effort of the organising committee which had Anbazhagan Poobalan, K. Kuppuswamy, Ravinder Banyal, C. Muthumariappan, Margarita Safonova, and Firoza Sutaria in addition to Prajval Shastri (Chair) and Sabyasachi Chatterjee, and the able administrative support provided by S. B. Ramesh, A. Narasimharaju, K. Shankar, K. Mohan Kumar and K. Lakshmaiah, along with the absolutely meticulous execution by the Vainu Bappu Observatory team, made for the organisational success of the the school. Prajval Shastri and Sabyasachi Chatterjee from IIA and Jogesh Babu of PennState were the co-ordinators.

- Prajval Shastri

Visit by winners of the Future Space Scientist contest of the Oracle Education Initiatives - India

On February 28, 2008, the Oracle Education Initiatives - India launched the 4-month long 'Student Space Scientist Program' involving school children, bringing into sharp focus the International Year of Sanitation and World Environment Day besides dealing with topics on Space. 10,000 students from about 240 schools across the country participated of which 350 students won awards. The winning teams of the contest were brought to Bangalore and the Oracle Education Initiatives organised visits by them to the premier research organisations in the city. A group of 45 students from Chennai, Gauhati and Bangalore visited IIA on August 26, 2008. They were accompanied by their teachers and the Oracle Education Initiative officials Mr Ajay Kapur and Mrs Kamal Deep Peter.

After a brief introduction to IIA and its field stations, the students were shown the movies 'From Nungambakkam to Hanle' and 'Powers of Ten'. This set the stage for the two popular astronomy talks that followed. The first talk was given by Professor Harish Bhatt on the Birth of Stars. Then Professor Jayant Murthy spoke on the 'Search for Extra-Terrestrial Intelligence' (SETI). Both the talks held the young audience spellbound. Later there was a brief but intense interaction session where the students and their teachers asked questions. The programme closed with a vote of thanks by Mr Ajay Kapur who especially mentioned that he was impressed by the fact that IIA's origin was traced back to the Madras Observatory established by the East India Company in the eighteenth century and that the institution has maintained an unbroken record of astronomical research, managing today observatories across the country from Ladakh to Kodaikanal.

IYA2009: Preparatory Workshop at Pondicherry

The seminar,"Universalizing the Universe", organized by IIA on April 4, 2008 (IIA Newsletter, June 2008) was a catalyzing event for many preparatory activities of IYA2009. Many science popularization groups from the southern states, who took part in the above meeting, began their own state level meets almost immediately afterwards and an all India materials preparation workshop was organized in Pondicherry in this connection on September 6 & 7, 2008. Attended by 60 delegates, the meeting had representatives from

Pondicherry, Tamil Nadu, Karnataka, Kerala, Andhra Pradesh, Maharashtra, Orissa, Jharkhand, West Bengal, Haryana and Madhya Pradesh. Many of the delegates are the resource persons in astronomy in their respective organizations and are also office-bearers in their respective organizations whose inputs will be important to give IYA2009 the required mass base.

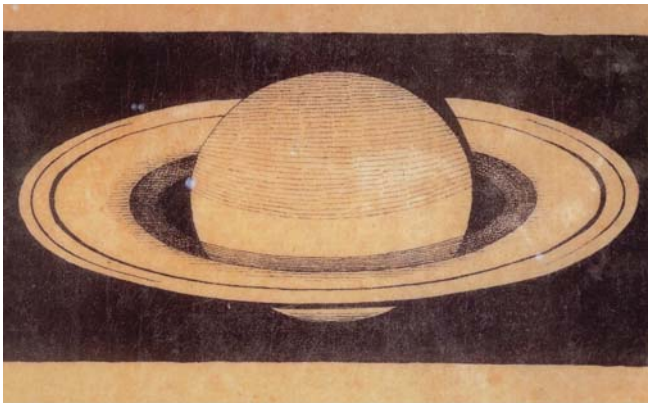
At the inaugural speech , Professor J. A. K. Tareen, Vice-Chancellor of the Pondicherry University offered the university's help in future activities related to IYA2009 and said that the university would be happy to set up a museum and an observatory for teaching and public outreach during IYA. In this workshop, which had six sessions, three scientists from IIA — S. Chatterjee, C. Muthmariappan and M. Safonova were invited as resource persons. S. Chatterjee gave an overview of the landmarks in astronomy, since Galileo's revolutionary challenge and showed how it opened the floodgates, which no authority could now contain. He showed how the history of astronomy in the last century could not be presented as a one-dimensional narrative but is to be replete with "flashbacks" . He mentioned the contributions of India to modern astronomy and astrophysics. He urged the student community to consider astronomy as a future career. The role of an observatory in popularizing astronomy was presented by C. Muthumariapan as he described the on-going programmes in public outreach at VBO and the future expansions that are contemplated. M. Safonova was the speaker on, "She is an astronomer", who while analyzing the gender issue emphasized the need to popularize astronomy at the primary school level itself which she had experienced in her school days in the former Soviet Union, where every school had a telescope, as is also the case in present Russia.

P. N. Shankar, formerly of NAL, Bangalore and A. Hemavathy (Pondicherry Science Forum) gave new ideas on night sky observations and galileoscopy. Vivek Monteiro (Nav Nirmiti, Mumbai) spoke on the issue of "*Sunderstanding with the Terralab*" while T. V. Venkateswaran (Vigyan Prasar, New Delhi) and K. Pappootty (KSSP) presented the materials on history of astronomy and on astrology they prepared after the Bangalore meet. It was decided to have district level meetings in every district and to propose to the state governments to train a hundred teachers in every district of the country as a part of IYA's cornerstone activity, "Galileo Teachers' Training Programme".Two separate workshops were planned for the Hindi speaking states and the North-Eastern states. It was decided to have the Pondicherry Science Forum, the organizer of the above meet as the coordinating agency for the groups that participated in this meeting.

The meeting was well covered by the press and other mass media, like the local TV channel and FM radio. The participants recalled the important role that IIA had played in organizing the seminar, "Universalizing the Universe" and said that it could be an appropriate slogan for the IYA2009, to be popularized.

- S Chatterjee

From the IIA Archives



W. S. Jacob, Director of the Madras Observatory (1849 – 1858), sketched this view of Saturn as seen on January 1, 1853. He used the 6" Lerebours & Secretan refractor on an equatorial mount for viewing the planet. *(Ref: Astronomical Observations made at the Hon. The East India Company Observatory Madras Vol. VIII, by W. K. Worster and W.S. Jacob, 1854)*

Uranus with its rings painted by M. K. V. Bappu in 1979.

Archaeoastronomy

Sunrise on September 24, 2008 (close to the autumnal equinox) at the Megalithic site Vibhuthihalli in Gulbarga District, Karnataka. September 22 & 23 were cloudy. Notice the alignment with the row of stones (4 could be seen in the picture).
Photo credits: N. Kameswara Rao, Venkat Manohar Reddy, Priya Thakur.

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Editorial Assistance: Suchitra K
Photo Credits: T. K. Muralidas

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