आईआईए न्यूज़लेटर

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Workshop on Resource Material for Day-time Astronomy

A panel discussion on the effectiveness and relevance of day-time astronomy for science popularization and education programmes

A two-day brain storming workshop on resource material for day-time astronomy was jointly organized by Vigyan Prasar and Indian Institute of Astrophysics at Bangalore from 18-19 November 2011. One of the main objectives of the workshop was to bring together several groups, organisations and renowned individuals who work at forefront of science popularization and education programmes in the country. Over the years these individuals and organizations have developed innovative teaching aids and activities for communicating astronomy to school children and general public. Opinions and ideas were sought to develop innovative resource material for daytime astronomy.

Astronomy is a powerful tool to fascinate and engage the imaginations of young minds. Scientific concepts and ideas in astronomy are communicated through innovative models, role plays, hands-on activities, popular lectures and interactive sky watch programmes. While the night sky has its own charm, the daytime astronomy is particularly useful for serving many pedagogical and social purposes. The obvious advantages being the leisurely access of the sun to everyone and at all places. Many activities can be easily planned and carried out during the school hours. That way astronomy learning can be an integral part of regular school curriculum. For various reasons, parents in India, do not quite encourage children, especially girls, to participate, e.g. in a public outreach or a

V. S. S. Shastri, a renowned science educator from Kolar explaining the distinct instruments used for astronomical measurements in Jantar Mantar through paper models

Paper models exhibited by a school teacher during the workshop

sky-watch programmes organized at night. The daytime astronomy is an effective way to compensate those limitations by facilitating the direct involvement and participation of girls and the underprivileged students. Also several simple, no/low-cost experiments can be performed with self-constructed equip ments to teach non-trivial concepts in physics and mathematic.No sophisticated equipment is really needed and children can begin performing experiments with the sun in early primary school. About 60 people from different parts of the country participated in the workshop. There were as many as 20 presentations by different speakers covering well over 100 different activities and teaching aids for daytime astronomy. A diverse range of topics such as Low-cost Heliostat for Observations of Transit of Venus, Astronomy through Role Models, Solar Analemma, Experiments with Self-constructed Equipment, Safe Projection Techniques for the Sun, Astronomy through Vigyan Sabha, Sun-related Quantitative Observations with Simple Equipment, Scientific Experiments during TOV-2012, Venus Transit 2012: Plans for Masses and

An interactive session of the live demos

Students etc. were covered in detail. After each presentation, the suitability of the material was evaluated by audience. It was proposed to develop and mass-produce a set of simple and low-cost activities for children to study the Sun, which would serve as vehicles for learning science by doing and discovering. These recommendations were made based on the written feedback on various talks, discussions, comments and many live demos conducted during the workshop. Discussions were also focused on the observations and mass participation of the upcoming Venus transit in June 2012 which is going to be the last transit of Venus for this century. The ultimate goal is to build the same level public awareness and excitement that was seen during various solar eclipses in last decade and also during the celebration of International Year of Astronomy 2009. In order to maximise the reach of these materials and foster an effective long term collaborations, participants also agreed to share resources and ideas without any copyrights or proprietary claim.

- Ravinder K. Banyal, Prajval Shastri and S. Chatterjee

Meeting on Science with Planned and Upcoming Solar Facilities in the Country

A meeting was conducted at IIA, Bangalore (November 2-3, 2011) to bring together solar physicists in the country to discuss ways and means to build greater synergy in the science programmes with the planned and upcoming solar facilities such as *National Large Solar Telescope (NLST)*, *Aditya I, Muti-Aperture Solar Telescope (MAST)* and other existing facilities. The talks were structured as follows: each session began with an overview of the facility along with the planned post focus instrumentation followed by presentations on specific science objectives. The lectures and the inaugural programme were open to all.

Nearly 50 scientists from various National Institutes and Universities participated in the meeting. A web conference facility enabled USO scientists to listen and view the lectures and ask questions remotely. Different methods to enhance student participation in the projects were explored.

- K. E. Rangarajan

P. Venkatakrishnan presented an overview of `Science with MAST

Prasad Subramanian spoke on GRAPES-3, a cosmic ray instrument at Ooty operated by TIFR

Mini Workshop on Cosmology and Galaxies

Biman Nath speaking on properties of the galactic wind.

Tarundeep Saini speaking on the futuristic experiments BBO and DECIGO can tightly contstrain distance-redshift relation.

A one day workshop on "*Cosmology and Galaxies*" was held on 28 November, 2011, as part of the activities of the theoretical astrophysics group at IIA. The workshop brought together researchers whose work focused on the closely related areas of cosmology and the study of galaxy formation and their properties, from three research institutes in Bangalore, namely, Raman Research Institute, Indian Institute of Science and IIA. There were also a few participants from other parts of India and one speaker from the Korea Institute for Advanced Study, Seoul, South Korea.

Mousumi Das speaking on the black hole masses for low luminosity galaxies which deviate strongly from the M-σ relation !

The workshop had four sessions. The first session focused on some of the big questions in cosmology, namely, issues related to the nature of dark energy and the epoch of reionization.Changbom Park spoke about how to use the topology of the Large-Scale Structure of the universe to constrain the dark energy equation of state. Tarun Deep Saini spoke on constraining distance-redshift relation using BBO/DECIGO observations. Ravi Subrahmanyan described how to probe the reionization epoch from redshifted 21-cm observations.

The second session had Biman Nath talking about properties of the galactic wind and the intergalactic medium, followed by Chanda J. Jog who explained how to deduce the prolate-shaped dark matter halo in the outer Galaxy from flaring HI gas. Then Prateek Sharma spoke about the role of hot Gas in massive dark matter halos.

The third session focused on specific issues related to properties of galaxies. Sivarani Tirupathi described the origin of carbon in early galaxies, Mousumi Das talked about AGN activity and black hole masses in low luminosity galaxies and Amit Shukla talked about multiwavelength study of TeV blazar Mrk421 during a giant flare.

The fourth and last session focused again on cosmology. Shiv Sethi posed the question: can a heavy charged lepton be a candidate for dark matter in the universe? He explained why it is worthwhile to pursue this question further. Then Rajesh Gopal described the effect of primordial magnetic fields on the collapse of baryonic region in the early universe. Finally, Pravabati Chingangbam showed that the WMAP data of the CMB contains a small amount of residual foreground contamination which can bias the estimation of primordial non-Gaussianity.

The workshop got enthusiastic response from astrophysicists in Bangalore, as was evident from the considerably large participation. It was a pleasure to see lively discussions and exchange of ideas after every talk. It ended on the optimistic note that there will be continued sharing of new research findings and avenues for future collaborations.

- Pravabati Chingangbam

Evolution of Spinning and Braiding Helicity Fluxes in Active Region 10930

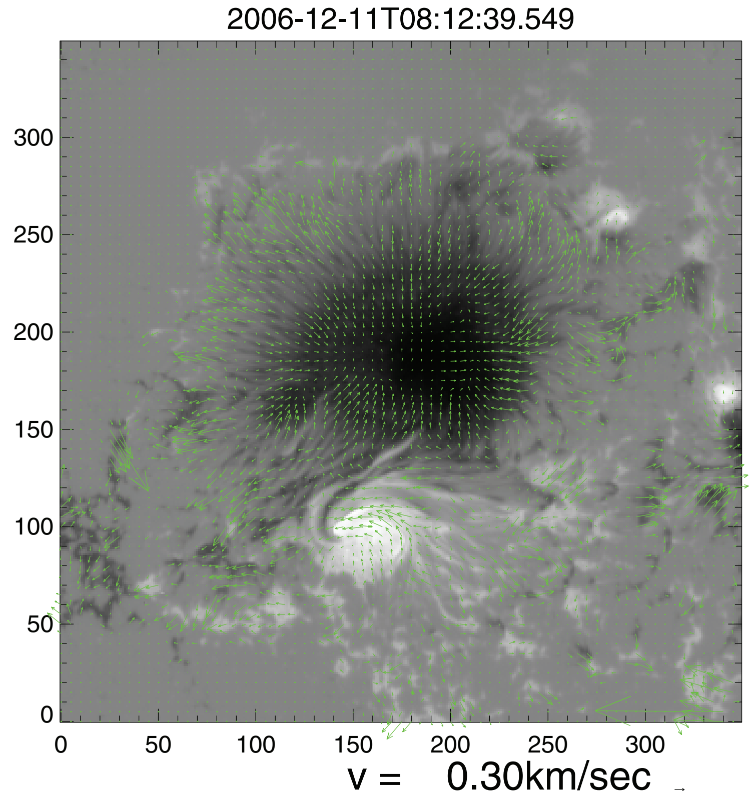
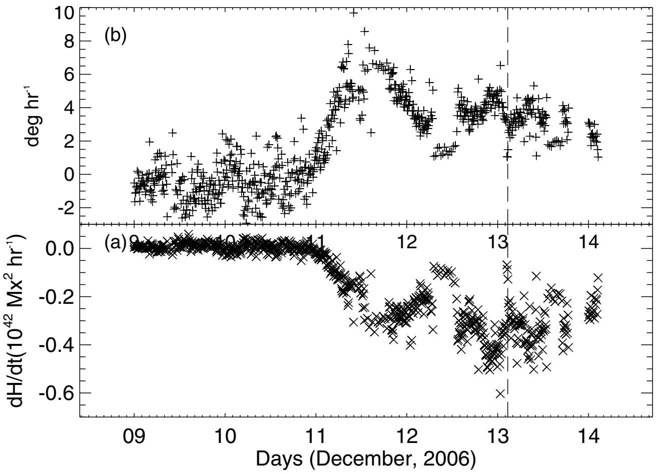


Figure 1. Horizontal velocity vectors computed using the local correlation tracking is overlaid upon the line-of-sight magnetogram image. The black color represents the South and the bright color represents the North polarity of the AR 10930. A pattern of rotation can be seen in the North polarity region.

Magnetic helicity is an important quantitative tool to understand the energitics and dynamics of coronal magnetic fields. Over the decade a long time sequence of line-of-sight magnetograms have been used to measure the helicity flux in active region corona. Longcope (2007) has decomposed the helicity flux into two components namely, spin and braiding helicity flux. The spinning helicity is the rotation of the flux tube around itself and the braiding motion is the motion of two flux tubes with respect to each other. We studied the evolution of spinning and braiding helicity flux in AR 10930 leading up to the large eruption on 13 December, 2006.The line-of-sight magnetograms from Solar Optical Telescope Narrow band Filter Imager observations of NOAA Active Region 10930 have been used to study the evolution of spinning and braiding helicities over a period of five days starting from 9 December, 2006. The north (N) polarity sunspot was the follower and the south (S) polarity sunspot was the leader. The N-polarity sunspot in the active region was rotating in the counterclockwise direction. The rate of rotation was small during the first two days of observations and it increased up to 8° hr^{-1} on the third day. On the fourth and fifth days it remained at 4° hr^{-1} with small undulations in its magnitude. The sunspot rotated about 260° in the last three days. The S-polarity sunspot did not complete more than 20° in five days. However, it changed its direction of rotation five times over a period of five days and injected both the positive and negative type of spin helicity fluxes into the corona. Through the five days, both the positive and negative sunspot regions injected equal amounts of spin helicity. The total injected helicity is predominantly negative in sign. However, the sign of the spin and braiding helicity fluxes computed over all the regions were reversed from negative to positive five times during the five-day period of observations. The reversal in spinning helicity flux was found before the onset of the X3.4-class flare, too. Though, the rotating sunspot has been observed in this active region, the braiding helicity has contributed more to the total accumulated helicity than the spinning helicity. The accumulated helicity is in excess of -7 $X10^{43}$ Mx^2 over a period of five days. Before the X3.4-class flare that occurred on 13 December 2006, the rotation speed and spin helicity flux increased in the S-polarity sunspot. Before the flare, the total injected helicity was larger than - 6 X 10^{43} Mx^2. The observed



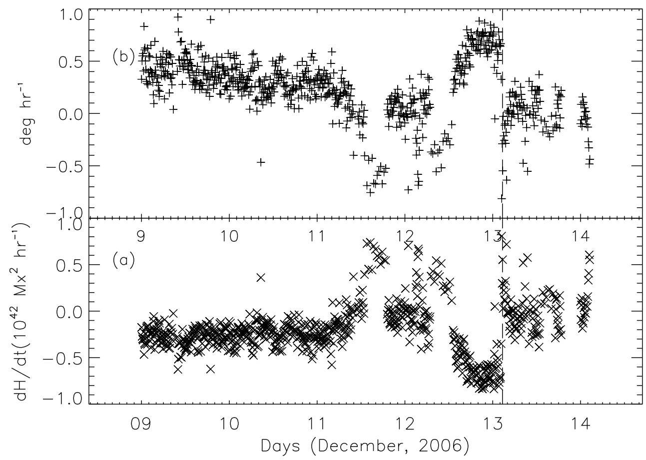


Figure 2. Top left: rate of rotation of the North polarity sunspot is plotted as a function of time. Bottom left: rate of change of spin helicity of North polarity is plotted as a functionof time. Top right: same as the top left plot but for the South polarity region. Bottom right: same as the bottom left plot but for the South polarity region. The dashed vertical line represents the onset time of the X3.4-class flare.

reversal in the sign of spinning and braiding helicity fluxes could be the signature of the emergence of a twisted flux tube, which acquires the writhe of an opposite sign. The magnetic cloud associated with the ejected mass has carried about -7 X 10^{41} Mx^2 of helicity. A time integration of helicity flux of about 1.2 hr integrated backward in time of the observation of the coronal mass ejection is sufficient for this event. These results are published in Ravindra et al. (2011).

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- B. Ravindra

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October - December 2011* $

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*** Names in bold-faces are authors from IIA**
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(LELIO) Lunar Eclipse Light Intensity Observer Experiment

Lunar Eclipse Light Intensity Observer (LELIO) Experiment is a simple device designed by Deshmukh Prasanna, Mayuresh Sarpotdar & Joice Mathew (all 1st year Int. M.Tech-PhD Students, IIA Bangalore) for observing light intensity variations during lunar eclipse.

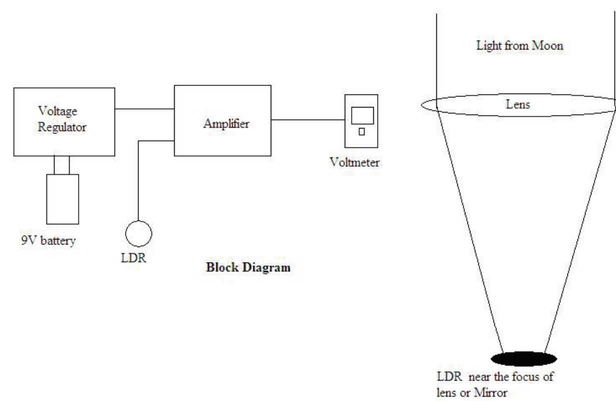
During lunar eclipse the light intensity variations are such that they can be measured by using a simple LDR connected to an amplifier. In order to collect more light a 1 or 2 inch lens with LDR near its focus can be used, as shown in the block diagram. Also a small telescope can be used to gather the light and the eyepiece is replaced by the LDR. During our experiment we used the 4" IIA telescope and replaced the eye piece by LDR of 2cm diameter.

Details of Experiment: Location: PGMS, 1- Vidyasagar Street, Kolkata-9, WB, India.
Date: 10 December, 2011. **Time:** 5pm to 10pm.

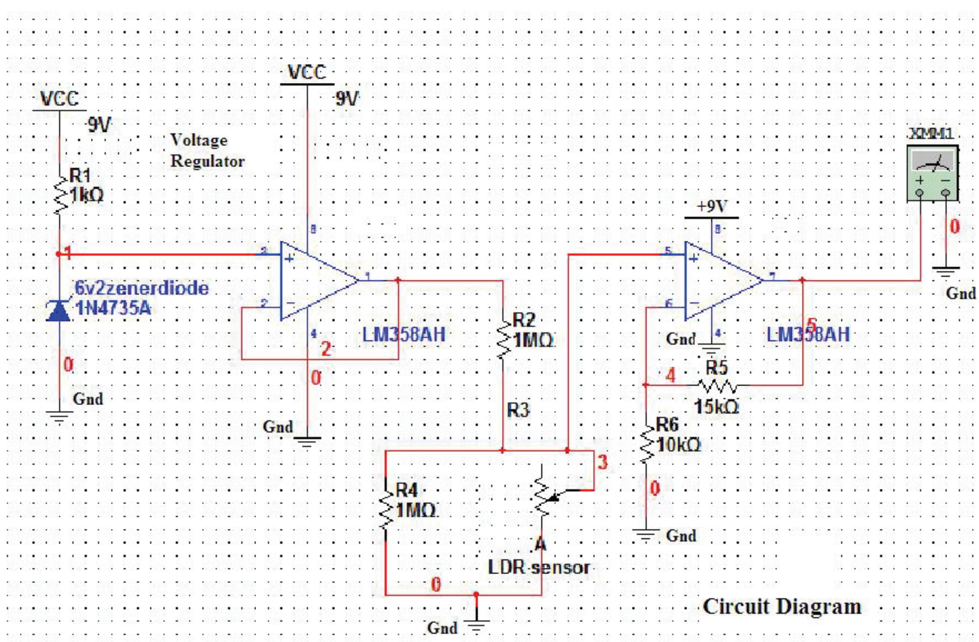
Following is the block diagram and circuit diagram we have designed which has a voltage regulator, amplifier and sensor part.

Here we have used an LDR sensor of 2 cm diameter with its resistance varying from about 100 k to 10 M for full moon and no moon conditions (when attached to the 4"

Mayuresh Sarpotdar, Deshmukh Prasanna & Joice Mathew during Lunar Eclipse of 10 Dec. 2011



Block diagram



Circuit diagram

IIA telescope). The circuit is designed using single LM358 IC (with 2 op-amps in it as shown above), which works on a 9v battery. For better operation we need a voltage regulator to account for the battery voltage variations for the complete time range of 5 hours of the eclipse. So we used a zener diode voltage regulator on one of the op-amp of LM358.

Following is the graph plotted from the data collected during Eclipse of 10 Dec. 2011.

Importance: This device is very useful for students and amateur astronomers. It is a low cost device and can be easily assembled by students. Using it they can take several readings during eclipse time (4 to 5 hours), and can plot the graph of the light intensity variations occurred during the eclipse, and can also compare it with other results. This will definitely inspire the students during the upcoming eclipses listed below.

- D.Prasanna, M. Sarpotdar, J. Mathew

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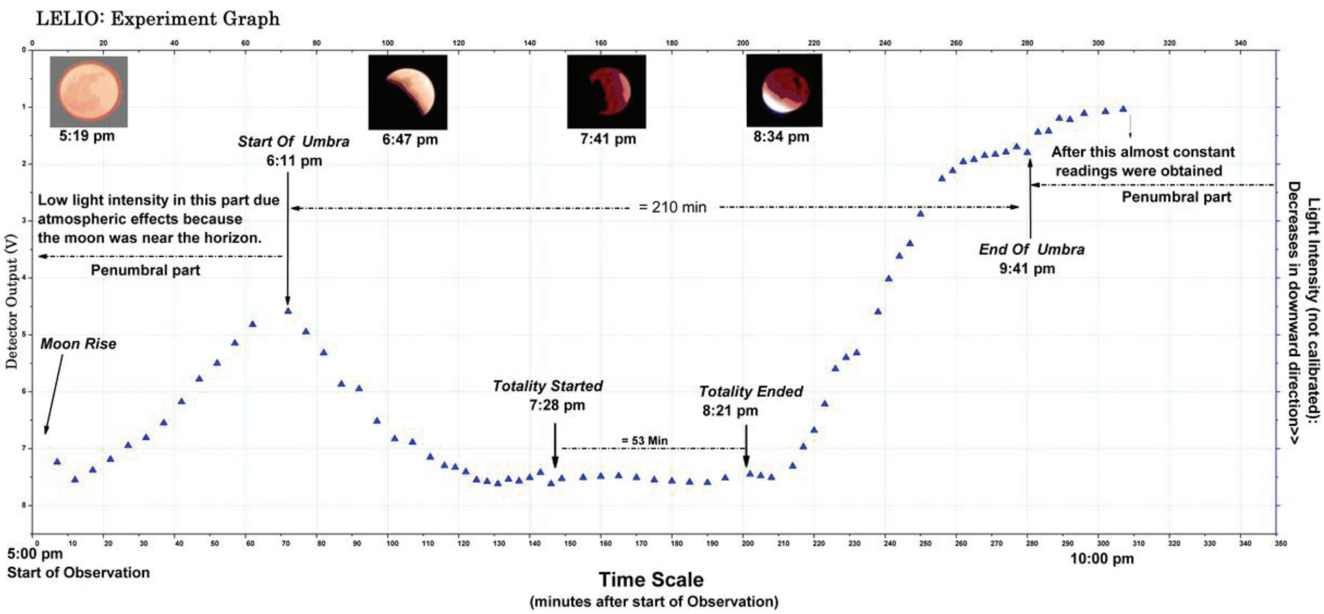

LUNAR ECLIPSES: 2011 - 2015

Calendar Date	Eclipse Type	Umbral Magnitude	Eclipse Duration	Geographic Region of Eclipse Visibility
2011 Jun 15	Total	1.700	03h39m 01h40m	S.America, Europe, Africa, Asia, Aus.
2011 Dec 10	Total	1.106	03h32m 00h51m	Europe, E-Africa, Asia, Aus., Pacific, N.A.
2012 Jun 04	Partial	0.370	02h07m	Asia, Aus., Pacific, Americas
2012 Nov 28	Penumbral	-0.187	-	Europe, E-Africa, Asia, Aus., Pacific, N.A.
2013 Apr 25	Partial	0.015	00h27m	Europe, Africa, Asia, Aus.
2013 May 25	Penumbral	-0.934	-	Americas, Africa
2013 Oct 18	Penumbral	-0.272	-	Americas, Europe, Africa, Asia
2014 Apr 15	Total	1.291	03h35m 01h18m	Aus., Pacific, Americas
2014 Oct 08	Total	1.166	03h20m 00h59m	Asia, Aus., Pacific, Americas
2015 Apr 04	Total	1.001	03h29m 00h05m	Asia, Aus., Pacific, Americas
2015 Sep 28	Total	1.276	03h20m 01h12m	E-Africa, Americas, Europe, Africa, W-Asia

भारतीय दृश्य प्रकाशीय खगोल प्रेक्षण वेधशालाएं

खगोलिकी परिचय : मानव सभ्यता के विकास के साथ ही इस रहस्यमय ब्रह्माण्ड को जानने की, समझने की उत्कण्ठ इच्छा के साथ ही खगोल विज्ञान का प्रारम्भ हुआ। मानव मस्तिष्क के विकास के साथ ही उसकी देखने की प्रकृति प्रदत्त ऑखों की शक्ति का अधिक तम उपयोग इस विज्ञान के सतत् विकास में हमेशा सहायक रहा। तदन्तर ऑखों द्वारा दृश्य प्रकाश के संकलन से प्राप्त सूचनाओं का ज्ञान ही खगोल विज्ञान की सतत् उन्नति का आधार बना। सूदूर अन्तरिक्ष से आने वाले इस प्रकाश पुंज को हम कैसे संबंधित कर स्पष्ट प्रतिबिम्बका निर्माण कर सकें यह खगोल विज्ञान के लिये इमेशा चुनौतीपूर्ण रहा। दूरबीन का आविष्कार खगोल विज्ञान के लिये क्रान्तिकारी कदम रहा। हालांकि दूरबीन का आविष्कार लिपरशे ने सन् 1604 में किया लेकिन गैलिलियो (सन् 1571 - 1630) ने सर्वप्रथम इसका प्रयोग कर आकाशीय पिण्डों का अध्ययन किया। दूरबीन द्वारा चन्द्रमॉ, सूर्य, शुक, शनि, बृहस्पति के स्पष्ट चित्र देखे गये और इन सभी का विस्तार से अध्ययन कर अन्य महत्वपूर्ण आविष्कार किये। धीरे - धीरे दूरबीन खगोल विज्ञान का एक अभिन्न अंग हो गया। अनन्त से आने वाले प्रकाश को हम अपनी ऑखों के छोटे से लैंस से संग्रहित कर जो अध्ययन करते वही प्रकाश संग्रहण धीरे -धीरे बड़े से सेन्टीमीटर, मीटर व्यास वाली दूरबीनों से किया जाने लगा। पिछले चार सौ सालों में दूरबीन तकनीक का निरन्तर विकास होता गया और इस तरह से इस ब्रह्माण्ड में हमारी पहूँच अनन्त से और अनन्त तक हो गई।

प्रेक्षणों में वातावरण की भूमिका: खगोल विज्ञान एक दृश्य प्रकाशीय विज्ञान के रूप में प्रारम्भ हुआ और आदमी ने हमेशा चाहा कि इस अन्तरिक्ष को बिना व्यवधान के देखे और अधिकतम जानकारी प्राप्त करे। लेकिन पृथ्वी का वायुमण्डल और हमारे आसपास का वातावरण इस अध्ययन में व्यवधान करता है। इसीलिये प्राचीन समय से ही मानव एकान्त और ऊँचाई पर स्थित जगहों का उपयोग करता था। अन्तरिक्ष के अध्ययन के लिये मात्र साफ - स्वच्छ आकाशही पर्याप्त नहीं है। वैज्ञानिक विकास एवम् दूरबीन प्रयोग के साथ ही यह मालूम हुआ कि पृथ्वी का वायुमण्डल और हमारे आसपास का वातावरण किस प्रकार से हमारे खगोलीय आंकलन को प्रभावित करता है। इस तरह से खगोल विज्ञान में ही - स्थल परीक्षण - विधा का जन्म हुआ और किसी भी वेधशाला की स्थापना में स्थल परीक्षण कार्य सहायक होता गया। उन्नीसवीं - बीसवीं सदी में विश्व में बहुत सी खगोल वेधशालाओं की स्थापना हुई। समय के साथ ही तकनीकी विकास हुआ और स्थल परीक्षण कार्य महत्वपूर्ण होता गया। अब दूरबीन के साथ ही अन्य सहायक उपकरणों का उपयोग भी स्थल परीक्षण चयन को प्रभावित करने लगा। आज वर्तमान में हवाई द्वीप समूह में समुद्र सतह से लगभग 14000 फीट ऊँचाई पर स्थित **मौना कया** पहाड़ी की स्थिति एवम् वातावरण खगोलीय गुणों के आधार पर प्रकाशीय दूरबीनों के लिये विश्व में आदर्श स्थान माना जाता है। इस चोटी की भौगोलिक बनावट, स्थिति, उच्च तुंगता, शांत वातावरण एवम् वायु शुष्कता इस चोटी पर स्थापित दूरबीनों में सुदूर अन्तरिक्ष से आने वाले प्रकाश पुन्ज को बहुत कम प्रभावित कर पाती है और स्पष्ट प्रतिबिम्ब का निर्माण कर सुदूर स्थित निहारिकाओं तथा तारा समूहों के बारे में निश्चित खगोलीय जानकारियांउपलब्ध कराती हैं। वर्ष में लगभग 80 प्रतिशत से ज्यादा रात्रि समय दूरबीनों के अधिकतम उपयोग के लिये उपलब्ध रहता है। लगभग पचास साल पहले 2.2 मीटर दूरबीन की स्थापना के साथ इस खगोल वेधशाला का आरम्भ हुआ और आज यह स्थान विश्व में सभी देशों के खगोल शास्त्रियों के लिये एक तीर्थ की तरह है। विश्व की बड़ी से बड़ी व्यास वाली विभिन्न देशों की दूरबीनें मौना कया पहाड़ी में सफलतापूर्वक कार्य कर रही है। दुनिया के इस उत्कृष्ट खगोल प्रेक्षण स्थल से हम विद्युत चुम्बकीय वर्णक्रम के दृश्य वर्णपटल के अतिरिक्त नजदीकी अवरक्त वर्णपटल के प्रेक्षण भी प्राप्त कर सकते हैं। दूरबीन से सम्बद्ध अति आधुनिक अवरक्त केमरा उपकरणों से प्रेक्षित सूचनाऐं हमें नवजात तारों के उद्भव को समझनेके लिये सहायक होती हैं। वर्तमान में विश्व की सबसे बड़ी तीस मीटर व्यास वाली दूरबीन परियोजना के लिये भी मौना कया स्थल ही चुना गया है।

भारत में दूरबीन प्रेक्षण एवम् विकास: दूरबीन के आविष्कार के कुछ समय बाद ही सन् 1651- 1689 के दौरान कुछ विदेशियों द्वारा गुजरात और पुदुचेरी स्थानों पर दूरबीन के प्रयोग कर खगोलीय प्रेक्षण लिये गये। आधुनिक विज्ञान के प्रादुर्भाव के साथ ही ब्रितानी शासकों ने ईस्ट इण्डिया कम्पनी के माध्यम से 1786 में भारत में खगोल विज्ञान की शुरूआत की और तद्न्तर में मद्रस वेधशाला का गठन कर विभिन्न छोटी दूरबीनों को स्थापित किया। इस दौरान कई महत्वपूर्ण शोध सामने आए। दूरबीनों के उन्नत और अधिकतम प्रयोग हेतु करीब एक सदी बाद मद्रास वेधशाला को 1887-99 में कोडइकनाल नामक स्थान में स्थापित किया। यह स्थान उच्च तुंगता क्षेत्र में स्थित होने के कारण एक उन्नत एवम् उत्कृष्ट वेधशाला के रूप में विकसत हुआ और आज भी कोडईकनाल सौर वेधशाला के रूप निरन्तर शोध में व्यस्त है।

सन् 1908 में निजाम वेधशाला अस्तित्व में आयी। इस वेधशाला ने आकाशीय मानचित्र बनाया और लगभग सात लाख पचास हजार से ज्यादा तारों की जानकारी का संग्रहकोश तैयार किया। नवीन भारत में हालांकि कई प्रसिद्ध वैज्ञानिक विश्व में अपना स्थान बना पाये जिनमें मेघनाथ साहा,चन्द्रशेखर वेंकटरमन, चन्द्रशेखर सुब्रह्मनियम, सत्येन्द्र नाथ बोस आदि प्रमुख हैं। लेकिन आजादी से पहले अन्य वेधशालाओं की स्थापना एवम् बड़ी व्यास वाली दूरबीन के लिये हम कोई भी सार्थक पहल नहीं कर पाये।

आजादी के बाद सर्वप्रथम 1955-65 में नैनीताल वेधशाला अस्तित्व में आयी। निजाम वेधशाला का उस्मानिया विश्वविद्यालय में विलय हुआ। 1965-71 में कावलूर वेधशाला का निर्माण हुआ। तत्कालीन वैश्विक वातावरण एवम् मौसम के अनुसार नैनीताल और कावलूर स्थल भारत में दूरबीन स्थापना के लिये आदर्श स्थल रहे और इन वेधशालाओं में अन्य छोटी दूरबीनों के साथ सन् 1972-73 के दौरान एक मीटर व्यास की समान दूरबीनों की स्थापना हुई। 1978 में 1.2 मीटर गुरूशिखर अवरक्त प्रकाश दूरबीन अस्तित्व में आई। इन सभी वेधशालाओं ने भारत खगोल भौतिकी के विकास में महत्वपूर्ण योगदान दिया। दूरबीनों के माध्यम से सुदूर अन्तरिक्ष के दृष्ट्य प्रकाश प्रेक्षणों पर आधारित शोध कार्य से भारत विश्व मानकों में अपना स्थान बनाने में सफल हुआ।

हालांकि सत्तर-अस्सी के दशक में जब हम एक मीटर व्यास दूरबीन से कार्य कर रहे थे, अन्य विकसित देश 3 से 6 मीटर दूरबीनों का प्रयोग कर खगोल भौतिकी में काफी उच्च स्तर पर थे। भारतीय दूरबीनों की स्थापना के साथ ही महसूस कर रहे थे कि विश्व में हम अभी दूरबीन निर्माण एवम् सम्बन्धित तकनीक में काफी पीछे हैं। इसलिये भारतीय सन्दर्भ में नैनीताल एवम् कावलूर वेधशालाओं की स्थापना के साथ ही हमारे देश में अन्य बड़ी

दूरबीन परियोजनाओं पर कार्य शुरू हो गया। अस्सी के दशक में कावलूर मे 2.34 मी व्यास वाली परावर्ती दूरबीन के निर्माण के लिये आवश्यक मूलभूत दर्पणतकनीक, यान्त्रिकी, विद्युतिकी नियन्त्रण एवम् सम्बन्धित प्रोद्योगिकी का देश में ही विकास किया गया और सन् 1986 में सम्पूर्ण स्वदेशी 2.34 मी वेणु बप्पू दूरबीन राष्ट्र को समर्पित की गयी। इस दूरबीन द्वारा प्रेक्षित खगोलीय आंकड़ों द्वारा तदन्तर में किए गए शोध कार्य का भारतीय खगोलिकी में महत्वपूर्ण योगदान है।

क्रमशः जारी अगले अंक में।

- भुवन चन्द्र भट्ट

(2-एम एचसीटी को पिछले 10 वर्ष से सफलतापूर्वक चालू करने के कारण हम **भारतीय खगोलीय वेधशाला-हॉन्ले**, **लदाख़** के लेख का पहला भाग प्रकाशित कर रहे हैं।)

Award

K. N. Nagendre receiving the award from Dr G. V. G. krishnamurthy, the former Chief Election Commissioner of India, on December 17, 2011 at a ceremony held at New Delhi

K. N. Nagendra received the **"Indira Gandhi Shiromani Award and Certificate of Excellence"**, given by the India International Friendship Society (IIFS), New Delhi, for: ***CITATION:- "Outstanding individual achievements and distinguished services to the Nation".***

The Award was presented by Dr. G.V.G. Krishnamurthy, the former chief election commissioner of India, on December 17, 2011 at a ceremony held in New Delhi. The award ceremony also included the seminar with the theme of ***"Economic Growth and National Integration".***

Farewell

IIA wishes all the best to ...

... Shri M.G. Chandrasekaran Nair joined the services of IIA on 28.06.1978 and was elevated to various positions. He retired as Senior Office Superintendent on the afternoon of 31.12. 2011 on attaining the age of superannuation.

... Shri T. Loganathan joined the services of IIA on 28.12.1981 at VBO, Kavalur and retired as Helper-E on 31.01.2012 on attaining the age of superannuation.

... Shri D. Elangovan joined the services of IIA on 11.04.1983 as Chowkidar at IIA, Bangalore and retired voluntarily w.e.f. 31.01.2012. He was holding the position of Helper-D on the date of retirement.

Sad Demise

Shri Dorjey Namgial joined the services of IIA on 14.08.2000 at IAO, Leh as Driver-A. He expired on 10.02.2012. He was holding the position of Driver Mech.-C at the time of his death.

Upgrade of Infrastructure

An advanced version of the lightning protection systems were installed at the Bhaskara guest house and in the main building of IIA.

Chandrasekhar Post-Doctoral Fellowship

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 the year. The fellowship is for an initial period of two years, extendable to three, with a monthly stipend of Rs.50,000/- to Rs. 55,000/- for candidates with up to 2 years post-doctoral experience and Rs 55,000/- to 60, 000/- for those with more than two years experience. An annual contingency grant of Rs.2,00,000/-, 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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