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'Funding astronomy research is investing in technology'

The Tuesday Interview
With
Annapurni Subramaniam
Director, IIA

Annapurni Subramaniam, who took over as the director of the autonomous Indian Institute of Astrophysics (IIA) recently, has a clear agenda to fulfil.

With a five-year mandate to improve the quality of research at the 233-year-old institute, Annapurni is on a quest to secure more funds for research even as she sets about executing several high-profile projects in the pipeline.

Already, the IIA has involved itself in a $1.4 billion international mega-science project to build a 30-metre telescope in Hawaii, in collaboration with the US, Canada, Japan, and China.

Other significant projects include collaborations with the Indian Space Research Organisation (Isro) to deploy two advanced space observation platforms. Under Annapurni's directorship, plans are underway to enhance infrastructure at various IIA facilities across the country. She unveiled her plans in an exclusive interview with **Akhil Kadidal** of **DH.**

What drew you to science and Astrophysics in particular?

I grew up in the small Kerala town of Palakkad, a town known for its musicians and artists. My parents were both musicians. I went through my early life with a Plan B to become a musician, but the lure of astronomy was always there. It crystalised in 1986, with the appearance of Halley's comet, which was perceived to be a bad omen. I was a BSc student then. Something about this reaction prompted me to try and understand the comet, to try to explain to people that it was a celestial visitor and that there was nothing malignant about it. This drove me to try to find answers about the larger universe.

So, you decided to study astrophysics for your PhD...

I did, and my first place of choice was the Indian Institute of Science (IISc), but I later amended my choice to IIA, which had started accepting students because it had telescopes. Soon, I was enmeshed in studying star clusters. Supernovae scatter materials all over the galaxy and studying these materials tells you the history of the galaxy. I was drawn to these kinds of stories.

You are the director of IIA for the next five years. What are some of the projects we can hope to see under your tenure?

Clearly, India's involvement in the 30-metre telescope, under planned development in Hawaii, will continue as will the building of the National Large Solar Telescope (NLST) in Ladakh. I also hope to kick off the 10-metre-class National Large Optical-Infrared Telescope (NLOT), which will be the first of its kind in India.

What is the significance of 10-metre-class telescopes?

Internationally, a lot of breakthrough in science has been coming quite fast—such as the detection of gravitational waves and the imaging of a black hole, in sub-millimetre wavelength. These were all made using 10-metre-class telescopes. We would like India also to be there making such breakthroughs. However, to do so means upgrading our capabilities from the two-metre-class telescopes that we currently have. We have to start now. It is not as if a guest arrives at your home for dinner, and you say, 'I shall now go to the market to buy ingredients.'

You had a project to launch the Aditya-I, a space observation platform, with Isro. What is the status of this project?

Aditya-I will be launched by the end of next year or sometime in 2021. We are starting the integration of the payload within the frame of the satellite. It is not a joke to integrate this system because Aditya is going to study the corona of the sun. This necessitated upgrading our clean-room facilities in terra firma to test the efficacy of the system. We now have a 10-particle-per-unit cleanroom at IIA's CREST facility in Hoskote where the integration and testing are being carried out. Following Aditya, we have also proposed to launch a next-generation UV telescope into orbit.

Is this a separate project?

Yes, this is a UV space observatory. It is called INSIST. It is an all-Indian spectroscopic Imaging space telescope, which will look at a galaxy, at a very high resolution.

When can we see this project to materialise?

It is in what Isro calls the pre-project phase. The technology demonstration is being carried out. If this proposal goes through, we will have a launch in the middle of the next decade. No one else will have anything like this in space.

A significant chunk of IIA's projects appears to be focused on studying the sun, why?

We are trying to find answers to an age-old question: when the temperature of the sun's surface is about 5,580° kelvin, why then is its corona, which is highly diffuse, about a million degrees kelvin? This temperature difference is baffling. We are trying to find answers as to how energy propagates from the centre of the sun to the edge. Now, we may already know about energy transfer methods such as conduction, convection and radiation but there appears to be a new method in play in how the sun transfers energy. By deciphering this, we can have a better understanding of how stars transport energy to the surface.

All of these projects and studies are being carried out in an annual budget of just Rs 150 crores? That does not seem like a lot.

It is a very moderate investment by the government. Scientific achievements require significant funds. India could lose out on these discoveries. One reason why we are involved in the 30-metre telescope project is that it will give us the know-how to build 10-metre-class telescopes.

How does the government feel about the scientific community's involvement in mega-science projects?

The government thinks that we are taking the easy way out if we partner to get access to an international facility. But it is not completely true. We are already down the ladder and we may need to skip some steps to climb faster. Indians must join the international community where we can pool expertise. This is a paradigm shift from how things were done in the previous century.

Commonfolk might ask what immediate benefit to the country will any of these breakthroughs bring. What would you tell them?

I would tell them that by funding in astronomy, we are actually investing in technology. However, it will take a while for these technologies to mature and become commercial. One example is cell phone cameras. These actually started out as extremely expensive charged-coupled cameras built as low light detectors for scientific requirements. Now, everybody has these cameras.