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Career stories, problems, and efforts in India to achieve gender balance in Astronomy

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WOMEN ASTRONOMERS OF IIA

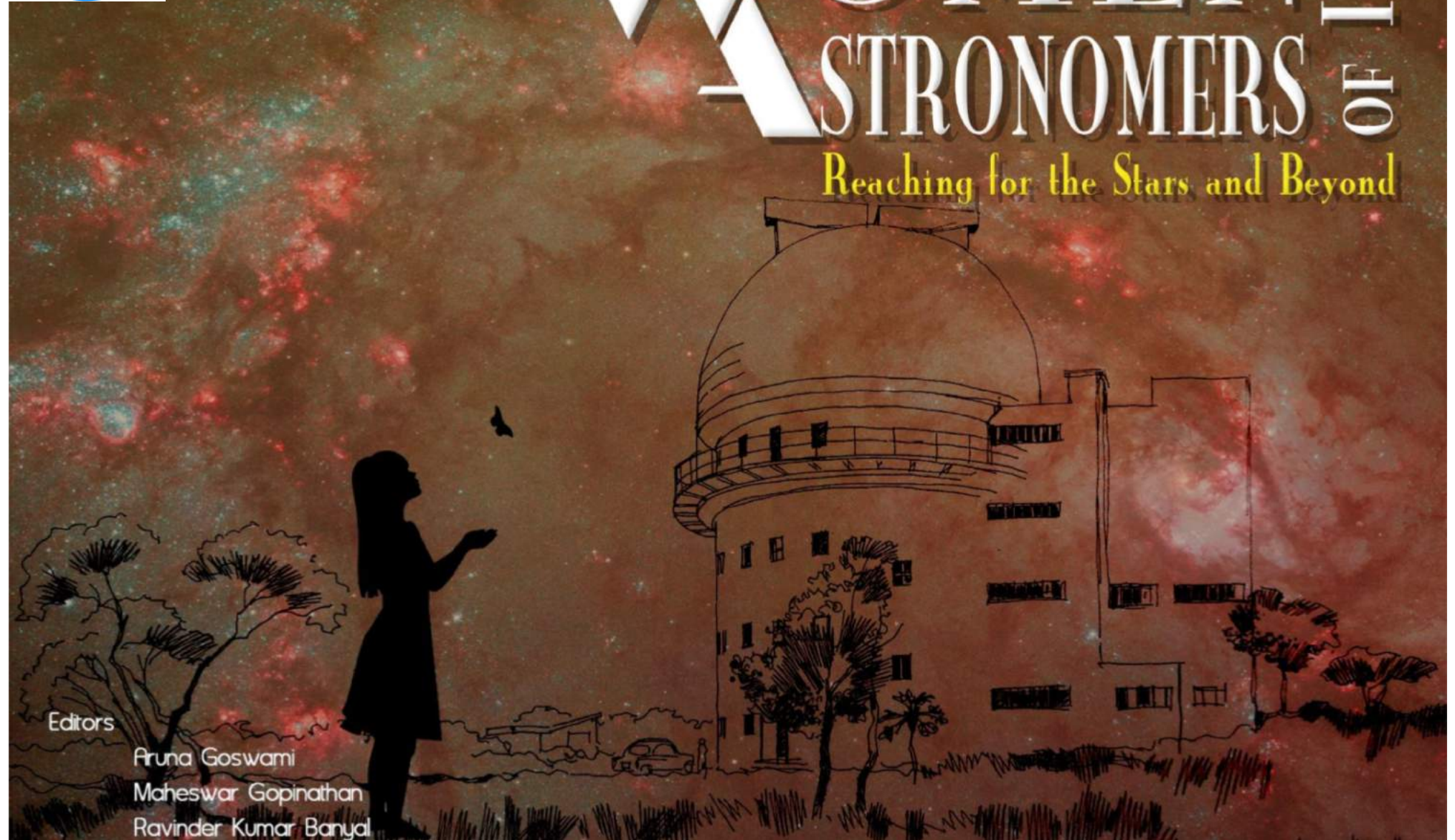
Reaching for the Stars and Beyond

Editors

Aruna Goswami

Maheswar Gopinathan

Ravinder Kumar Banyal



The book:

- Articles from 50 women astronomers of IIA on their career journey.
- All from the IIA – large age range – include former and current members
- This was part of the Golden Jubilee of the IIA
- The e-book was released by Ewine van Dishoeck on 30 March 2021
- A few more articles were added since then to make it 50 women.
- There are many more women who were part of IIA, apart from these 50. The idea of the book was to capture the inputs across the spectrum. The hard copy is now ready.

<https://www.iap.res.in/IIA50/sites/default/files/Women-Astronomers-IIA.pdf>

The book as a case study of an organization with women astronomers:

- This book provides a sneak peak into the environment in the organization over 50 years.
- From the days when IIA was formed in Kodaikanal to the current days, when it is located in a city.
- In this talk, I would like to share the insights I gained from reading the articles.
- The IIA has been inclusive all along and continue to be so. It will be interesting see how an organisation can achieve this and sustain it.
- Many articles capture how they got into science and astronomy.

Message from Prof. Ewine F van Dishoeck

President, International Astronomical Union (IAU) (2018 – 2021)

"The stories in this booklet are heart-warming: they illustrate the hurdles that female astronomers had to overcome but also their passion and love for the night sky. They will form an inspiration for future generations of young women in science. India has so much potential in this field; let the stars shine for everyone!"

Prof. Ewine F van Dishoeck
Professor of molecular astrophysics, Leiden Observatory,
Universiteit Leiden, the Netherlands.



Preeti Kharb

Reader-F, National Centre for Radio Astrophysics, Pune

I completed my Ph.D. on active galactic nuclei at IIA in 2005, with Prajval Shastri as my thesis supervisor. After my Ph.D., I went on to carry out postdoctoral research in the USA. I returned to India to take up a faculty position at IIA in December 2012. I remained at IIA till September 2016, after which I took up my current faculty position at the National Centre for Radio Astrophysics-Tata Institute of Fundamental Research in Pune. My association with IIA, first as a student and later as a faculty member, has, therefore, been fairly long. And most of these years have been both pleasant as well as productive. Indeed, IIA has played a crucial role in my career. Without the support of fellow students, teachers, mentors, and later colleagues at IIA, I would most likely not have been an astrophysicist today. I remember my IIA Ph.D. interview particularly well. Eminent scientists like Bhaskar Dutta, Harish Bhatt, Bhanu Das, Venkat Krishnan, and Sabyasachi Chatterjee, were on the interview panel.

I remember how they consciously tried to make the interview less intimidating. This helped me relax and perform better than at similar interviews in other Institutes. This ease with being a scientist is what makes IIA unique among the astronomy institutes in India. The non-toxic environment is conducive to carrying out excellent scientific research. During my time at IIA, as a student and a faculty member, I never stood apart from, or felt alone, in terms of my gender. That is because IIA had, and still has the highest fraction of women students as well as faculty members in any astrophysics institute in India. This diverse environment



comes with a culture of acceptance, and a realization that scientists, like science, come in all shapes and sizes.

IIA's inclusive culture extends to its remote observatories. I have carried out observations at the Kavalur observatory as well as the remote observatory at Hoskote. I have visited the Kodaikanal observatory to give lectures for the IIA Winter School, and the Gauribidanur radio observatory to work with Ph.D. students. Everywhere, the welcoming environment prevails, and nowhere was I made conscious of my gender. Never did I feel out of place. The inclusive environment extended to talks in journal-clubs, and Institute seminars and colloquia. Questions were politely asked, and the speakers were made to feel welcome. I realized later that this was not always true at other research institutes in India.

Interestingly, it was in a casual meeting sitting under the trees at IIA, that the idea of a 'working group for gender equity' first came about. We set about obtaining gender statistics for students, postdocs, and faculty members for all astrophysics institutes in India. These data clearly showed that less than half of the fraction of women students enrolled in the Ph.D. programs finally ended up in permanent positions as faculty members. We

submitted a formal proposal to the Astronomical Society of India (ASI) for the setting up of a working group, citing these gender statistics, and emphasized the need for gender-sensitization in the community. The Working Group for Gender Equity (WGGE) was formally created by the ASI in 2015, with Prajval Shastri and me as members from IIA, along with astronomers from various institutes across India. The WGGE (<https://astron-soc.in/wgge/>) is now widely acknowledged to have been instrumental in the beginning of the conversation on gender equity within the Indian astronomical community.

In the future, IIA must continue to appreciate its inclusive working environment and recognize the role played by its diverse scientists in making it so. Without conscious awareness and effort, such an inclusive environment, or the relatively healthy gender fraction at IIA could easily slip away. Currently, one-fourth of IIA's faculty members are women. With the largest number of astrophysicists in any institute in the country, IIA is in the best position to nudge this ratio towards one-half and create a truly gender-equitable institute in India. Hopefully, others will follow.]



Vagiswari A.

Librarian, Indian Institute of Astrophysics, Bangalore (Retired)

I joined the Indian Institute Of Astrophysics at Kodaikanal on 14th March 1974 when a large number of scientists and other staff was recruited soon after the observatory was declared an autonomous body. I was practically the only woman on the campus. This hardly made any difference as I became an integral part of the group of newly appointed scientists. Some of them became my close friends and we also collaborated on some projects. On my first day, I was fascinated to see the main hall of the library; it was beautiful and colourful with journal volumes stacked from the floor to the roof. Each journal followed its own colour code, a practice that was continued till recently. The binding section to support the colour code was the pride of the Institute. As I took charge of the library, I was little worried about handling science literature as I had a social science background.

But fortunately, Dr. Bappu the director visited the library and to my pleasant surprise said he would help me in the classification of the literature. Dr. Bappu was a great teacher and I soon grasped the nuances of subject classification. I learnt that nothing was too small for him and no one was unimportant. I felt great admiration and respect for him. The library received more than 100 observatory publications from all over the world and some even from very remote observatories; there were several modes of scientific communication which are unique to Astronomy. There were



Women Astronomers of IIA

From 1983 onwards I began observing occultations of stars by planetary systems including asteroids, mutual events between the Pluto Charon and the Galilean satellites. Beginning in 1996, my interests diversified to study the dust features of comets. Visits to the Vainu Bappu Observatory for observations were always enjoyable. I remember the days around mid-1986 when I was carrying out direct imaging at the prime focus of the Vainu Bappu Telescope (VBT). Those were the days of photographic plates, and I used to sit strapped in the cage of the Prime focus and guide. After exposure, the plate holders were lowered to the observing floor below to retrieve the exposed plate and load new one by a colleague. While observing, if I just leaned back and turned around, I could have a breath taking view of the star studded sky and if bent a little more, I would be rewarded with a view of the horizon and far away villages. In those years, we used to take the morning train to Vaniyambadi or Jolarpet from where we were picked up by the Observatory shuttle vehicle. On the return trip to the railway station, I enjoyed the view of the lush valley and plains down below and the happy chatter of the accompanying children of the VBO staff going to school.

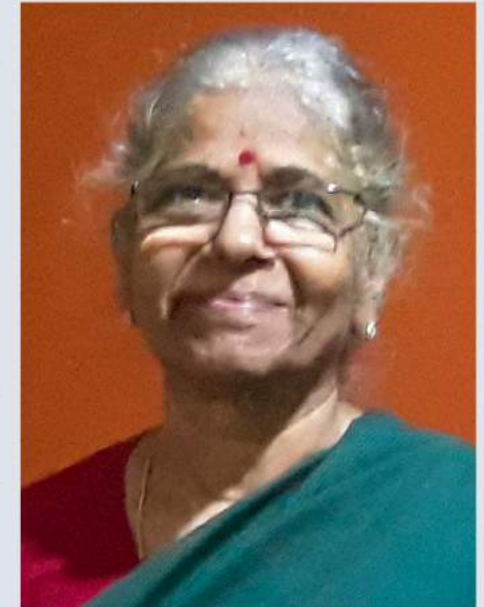
I supervised Pavan Chakraborty towards his Doctoral thesis on investigations of comets. A part of his thesis involved fabrication of an optical dual-beam spectropolarimeter as an add-on facility

to the Boller & Chivens spectrograph at the VBT. I computed the orbits of the likely new asteroids for the KALKI project of Prof. R. Rajamohan & Prof. J.C. Bhattacharyya that started in 1987. As a member of the project KALKI, I was co-recipient of the Astronomical Society of India Discovery award, 1996 for discovering the asteroid Ramanujam. I participated in the International campaigns to observe the important events like the impact of the fragments of Comet Shoemaker Levy 9 on Jupiter in 1994, and the "Deep Impact" event following the impact of NASA's deep impact probe on comet Temple 1 on July 4, 2005. The collaboration with the Group at Institut de mécanique céleste et de calcul des éphémérides, Paris to observe the mutual events of the Galilean satellites continued over 5 seasons starting from 1985 with the last one in 2021.

IIA has a work atmosphere that is conducive to research. I cherished the academic freedom here. Proposals for financial requirements for equipment were taken seriously without bias, if these were well researched and presented in the committee meetings for evaluation. Discussions with seniors and peers were productive. I superannuated in 2004 after 22 years. Because of my late start, there were some colleagues in higher positions who were of my age. My peers were at least a decade younger. However, I felt comfortable in interacting with them all

Vasundara R

Institute of Astrophysics, Bangalore (Retired)



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Vinod Krishan

Bappu ready to report to the police the missing first woman astrophysicist along with the other two! I became a part of every activity in the institute, whether it was the turning over of the two meter blank, the furnishing of the guest house or the selection of the staff and the students of the growing institute. With my plasma physics background, I found the whole universe to be my playing field. There was so much that was new and so much could be done. With encouragement from elders and cooperation from colleagues, there was no looking back. Prof. Bappu asked me to interact with the solar radio astronomy group which could use some theoretical support to model the radio burst emissions from the sun observed from the Gauribidanur Observatory. The collaboration resulted in several research papers and I was happy to find myself useful to the Institute's projects. I fondly remember when Prof. Bappu presented a short movie on the flaring sun and soon after came to my office and asked me what I had made of it. He appeared to be quite satisfied with my response that it was too complex to say anything definitive about it. Soon I developed my own research orientations and worked on plasma physical phenomena in locales as disparate as the sun and the active galaxies. Simultaneously, my interest in astrophysical turbulence propelled me to propose a model for the multi-scale convective

phenomena of solar granulation and the magnetohydrodynamic distributions of magnetic and kinetic energies in the solar wind. I even dared to present an alternative to Dark Matter, at least, in connection with the flat rotation curves of galaxies. The Institute provided us every possible opportunity to spread our wings. Whether it was the organization of a symposium on Basic Plasma Processes on the Sun under the banner of the International Astronomical Union, workshops on Solar Physics, schools on Astrophysical Plasmas, inviting scientists from other institutions, attending national and international conferences and additions of books and journals to the library, I received total support and enough leverage to carry out my plans towards the pursuit of a satisfactory career. The three decades in IIA passed before I knew, as if in a dream. What I most cherished about IIA was the space it provided for an individual to grow. There were no big brothers watching, no one breathing down your neck. The only limit was your own imagination. From sun to stars, galaxies, black holes, the whole universe, nothing was beyond our grasp. Although I joined the IIA as the first woman astrophysicist, soon only the astrophysicist remained. The very fact that a student of IIA grew up to be the director of the Institute speaks volumes for the nourishing soil and sky of the Indian Institute of Astrophysics. And here we have our first woman director !

Vinod Krishan

Indian Institute of Astrophysics, Bangalore (Retired)

as at the IIA in
Bangalore campus
is still in the
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did in almost
every aspect of the
institute. I
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for the right kind of plates, glasses and other sundry
returned to the IIA late in the evening to find Prof.



Anupama G C

Senior Professor and Dean, Indian Institute of Astrophysics, Bangalore

I had always wanted a career in science, and when I found there was an opening at IIA for a Ph.D., I applied and was selected. And, since then, it has been a long and delightful association with IIA. Although I cannot say that astronomy was something that I “craved” to do, I am glad I got into this field. My interest in astronomy as a research area was probably triggered by two events that happened while in B.Sc. One was a talk on Jupiter by M.K. Vainu Bappu that he gave at the Bangalore Science Forum, and the other was the total solar eclipse of 1980. Witnessing the eclipse was an experience of a lifetime. Having always enjoyed working with instruments, a career in observational astronomy has been the best thing that has happened to me. And, being in IIA has made it extra special. My postdoctoral years at IUCAA helped me become confident and more independent. I have learned a lot from my seniors and consider myself lucky to have been associated with some of the best astronomers (in the country) of my time.

I was fortunate to have T.P. Prabhu as my supervisor. Just watching him do things was an excellent learning experience. IIA is also an institute that has always had a healthy presence of women scientists (healthy doesn't necessarily mean in numbers though), and with almost all of them being observers.



It's been a long journey as an astronomer – 38 years now! Looking back, I feel satisfied with what I have “achieved”. The early days of observing at VBO were the most thrilling, and later being associated with the 2m HCT project, working at IAO has been most satisfying. Not to forget my involvement with the

Swara Ravindranath

JWST/NIRISS Instrument Scientist, Space Telescope Science Institute, Baltimore, USA

I became interested in astronomy during my college days when I was doing my graduation with a major in Physics. After college, I joined the Ph.D. program in astrophysics at the Indian Institute

I moved back to Space Telescope Science Institute (USA) where I am currently working as a scientist for the James Webb Space Telescope (JWST). I am also a member of the Science Definition Team for the Grace Roman Space Telescope, and a member of the International Science Definition Team for the Thirty Meter Telescope (TMT).



Swara Ravindranath

observations (such as, GOODS, CANDELS, UV UDF, and UVCANDELS) using the Hubble Space Telescope, and have used the high-resolution images to study the morphological evolution of galaxies through cosmic time. More recently, I have been using spectroscopic observations of star-forming galaxies to understand the physical conditions in the nebulae produced by hot massive stars. My current research focuses on identifying spectral diagnostics which can be used to study the galaxies in the reionization epoch of the Universe.

I am proud to have been part of the IIA family. The institute has been a leader with respect to gender diversity. When I joined IIA, there were significant number of women astronomers, post-

docs, and research students, in spite of the fact that astronomy was not a common career path. Over the years that I spent at IIA, the issue of gender bias never crossed my mind, because as far as I know the issue was never there. Only after I left IIA, did I realize that gender bias is a serious problem in academics even in some of the most developed countries. My opinions are solely based on my personal experiences, and I would like to see IIA continue to hold its high values. IIA has to be recognized for how progressive its outlook has been over the years and continue to be appreciated for the contributions of strong, career-oriented and passionate women astronomers who enrich the culture and success of this astronomy institution.

doctoral research on the topics of galaxy formation and evolution. I have been a collaborator on many deep survey



Anupama K

Engineer-D, Indian Institute of Astrophysics, Bangalore.

I am pleased to express my feelings as part of IIA from the past 14 years. I felt working at IIA has a positive impact on all aspects of my life. It's always encouraging in all sorts of technical work. We feel safe at any type of Scientific/Technical project at IIA at any given time. Thanks to the institution for giving me such a safer environment.

I am fortunate that I got support for pursuing my higher studies by my senior officers. I have been encouraged to attend technical seminars and training programs.

I've been lucky enough in my career at IIA, to have senior men as my reporting officers. I'm seeing leaders make more concerted effort to offer women opportunities, mentorship, and challenges and most importantly reinforcing feedback to help accelerate their career and recognise their contributions.

We are living through a transformation in the world of work. Automation and "thinking machines" are replacing human tasks and jobs, and changing the skills that organisations need to be successful. In this time of rapid change, how can organisations make sure all their employees – regardless of gender – have the chance to succeed? They will need to keep a relentless focus on gender diversity while upskilling their people. Achieving gender equality is all about equal opportunities. Equal opportunities for people to learn new skills progress their careers and reach their full potential.



Anupama K

I feel Institutions can be made more attractive, inclusive and competitive by adopting and adhering to simple guidelines. For example, more women can be encouraged to apply by ensuring that job descriptions are gender-neutral and appointment committees are gender-balanced. Alternative hiring pathways

can allow employees to move into different roles. Identifying, celebrating and giving more visibility to women's achievements can also help achieve gender equality. Furthermore, training women for leadership positions and allowing them to embrace their own leadership style would be a welcome step.



Geetanjali Sarkar

DST Women Scientist, IIT Kanpur

My love for Physics and the desire to do a Ph.D. made me apply to IIA in 1997. It was here that I got my first introduction to astronomy beyond school books. Our course work was spread over three institutes -- IIA, RRI, and IISc., which was a unique experience in itself. During my course work, I got an opportunity to attend a summer school in Italy. It was here that I realised that being a part of IIA, we were lucky to have hands-on experience with optical telescopes -an opportunity that was then not available to several attendees of the school. IIA gave me the freedom to choose my specialisation in astronomy and an environment to grow in and love the field. The grounding here was so solid that I could make a comeback to the field after a break of 9 years in my career! After my Ph.D., I was offered a post-doctoral fellowship at IUCAA, Pune. I worked there for a few months, after which I joined my husband at IIT Kanpur. I was offered a two-year research fellowship at IITK.

I wrote a ESO proposal for observations of hot post-AGB stars which was accepted. I then worked under DST's Fastrack program for young scientists. Thereafter, I had to take a break due to family reasons. I made a comeback to the field with DST's WOSA scheme in 2018. Currently, I run a successful collaboration with a faculty member at Jet Propulsion Laboratory, California, USA. I have recently also submitted a proposal for the soon to be launched James Webb Space Telescope (JWST) and await the results. All this and much more I owe to my training at the Indian Institute of Astrophysics.



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Ph.D. times, while attending talks, I seldom felt the urge to ask questions but I refrained myself from doing it. Now I realise that is not a good strategy in research. So, IIA should nurture an environment where a Ph.D. student (or anyone for that matter) can ask the stupidest question. On the personal front, I believe the working environment can be improved. For example, since the Ph.D. students all stay in the same hostel, we tend to mix up our personal life and professional life. As a woman in STEM, I had to face difficult questions from my colleagues about my personal life. Like, when am I getting married, when am I having babies. Drawing a clear boundary at the personal and professional aspects of life is necessary. The only way to tackle this kind of issue is creating awareness among our colleagues. So IIA as our employer can do a lot in this aspect, especially since there are a lot of women scientists working in IIA. The gender cell of IIA can contribute a lot in that aspect.

Ramya: When I joined IIA and looked at all the women scientists around me, I did not notice much about anything related to sexism or harassment. But somehow, over the last 5 years, I can recall some experiences where I have experienced these and have not done anything about it. Partly because I wasn't aware of the gender cell in IIA or its activities. Also, I don't think we

Women Astronomers of IIA

were given any orientation regarding these issues during the joining. Don't you think, that should be an important part of the orientation and also, it's very essential to make the workplace safe for women.

Ambily: Yeah, I agree with both of you. Many times we don't even realize what the acceptable boundaries are, so orientation sessions are essential for people of all levels of power. We should also expand the services of the gender cell into more of a diversity committee. Like how we talk about sexism, there would be people who feel discriminated against for their socio-

Ramya, Ambily & Sireesha

Ramya, Ambily & Sireesha

Ambily is currently a Postdoctoral fellow at LASP, Univ. of Colorado, Boulder, Ramya is working as a Post-doctoral fellow in the WALOP project in IUCAA, Sireesha is a researcher at the German Aerospace Center (DLR).

It was a summer afternoon towards the end of Ramya, Sireesha, and Ambily's Ph.D.. They were friends for most part of their IIA lives, and were reminiscing about their research journey over some cups of coffee on the IIA terrace. They spoke about what led them to start their science career in IIA, the joys and regrets on this journey, and their hopes and aspirations for the future.

Ramya: I joined for a Ph.D. in astronomy, partly because of my dad (being a researcher himself) and the interest in space was due to Kalpana Chawla. What about you both, why did you quit your high paying jobs and start your research career?

Sireesha: The pictures taken by the Hubble telescope, those wonderful colorful images of the sky inspired me and made me wonder about the marvelous universe. I was truly fascinated by those pictures. However after my graduation (in engineering)

I chose to work in the industry for a while. But my love for astronomy compelled me to pursue higher studies in astronomy. That's why I choose to do the integrated M.Tech-Ph.D. in astronomical instrumentation.

Ambily: I think mine is a similar experience: mostly through popular science books and magazines in my childhood. But it is funny that the three of us initially studied to be engineers and then took up astronomy! For me, it was because I didn't know




Sireesha: Yes! I find it weird if one of my colleagues calls me Ma'am. I prefer them calling me Sireesha. It helps in breaking the hierarchy and gives an equal space for useful academic discussions. Finally, Ramya, Ambily, how do you feel overall about life at IIA?

Ramya: I did like my life in IIA during Ph.D., I met a lot of people, learnt a lot from the experiences which helped me shape my personality. I just wish we had much more space in our campus and it was far away from all the traffic noise. At the end, research involves a lot of thinking which demands some amount of peace

Important points that emerge:

- There are women members as part of the organization at all levels, over the last 5 decades.
- They are part of wide range of activities of the Institute (cutting edge to routine) - a very important point to adopt for an inclusive culture.
- The women members are passionate and serious astronomers. Irrespective of their fame/success/background, all of them they have been role models all along for the future generations.
- For the organization to sustain the same culture, continued hiring of women and consciously making them part of activities at all levels is highly important.
- Should encourage diverse environment and the culture of acceptance.
- The Institute has produced women in leadership roles. This has to continue.



An autobiographical sketch of women scientists from
the Indian Institute of Astrophysics, Bengaluru.

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