

# WOMEN ASTRONOMERS OF IIA

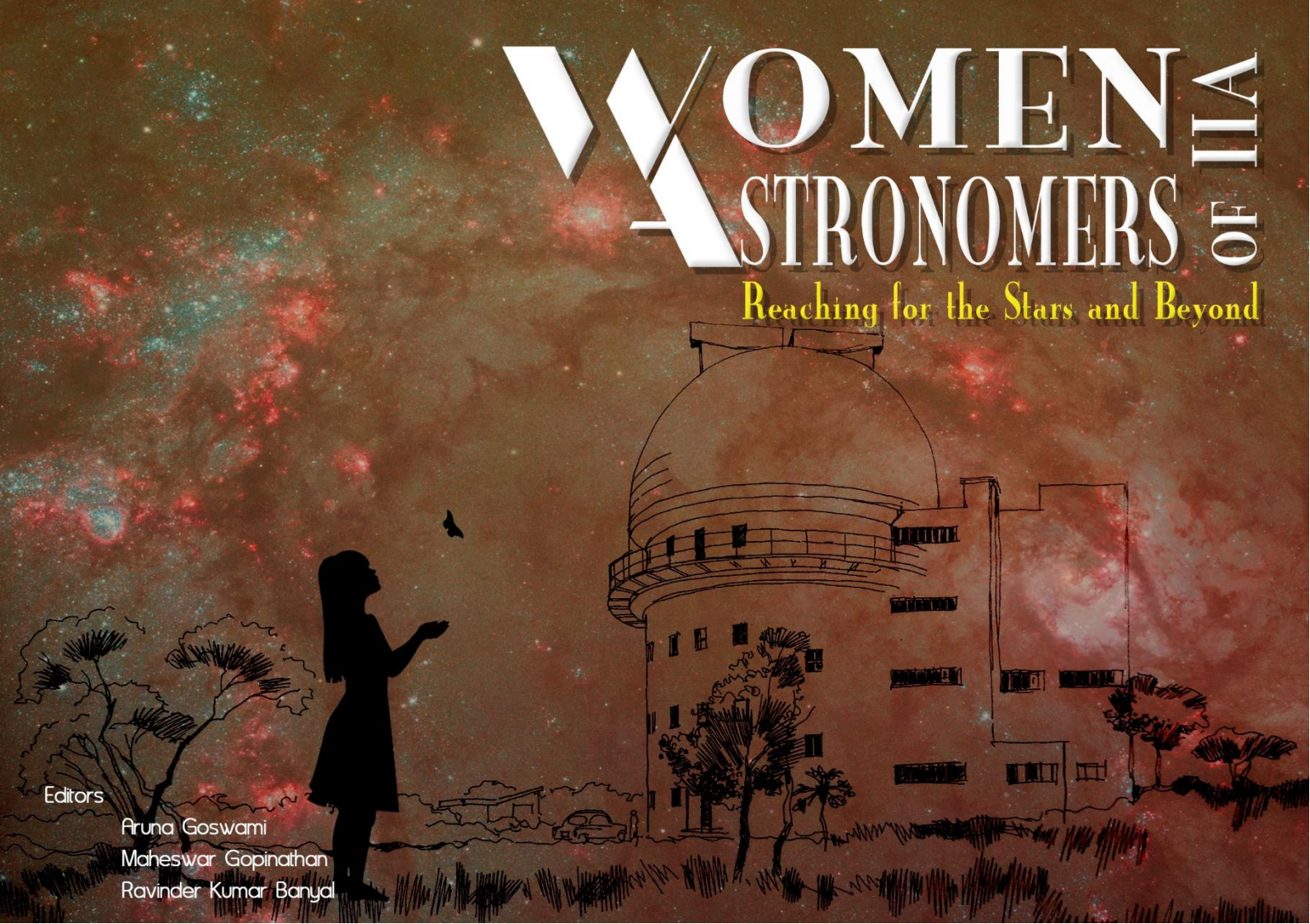
*Reaching for the Stars and Beyond*

Editors

Aruna Goswami

Maheswar Gopinathan

Ravinder Kumar Banyal



# Women Astronomers of IIA



*Editors:*

***Aruna Goswami, Maheswar Gopinathan, Ravinder Kumar Banyal***

*Indian Institute of Astrophysics, Bengaluru 560034*



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## *Preface*

Under representation of women and other minority groups has been a serious concern in many research fields -both in India and abroad. A long-term commitment is needed to both understand and to address this lack of diversity. This year, the Indian Institute of Astrophysics (IIA) is going past 50. It is a momentous occasion in the history of the Institute and a proud moment for all of us to be a part of this incredible journey. Among many accomplishments, gender diversity has been an important part of the Institute's legacy. Over the years, IIA has maintained a healthy gender balance and produced a large number of women scientists in the country. Many of them have gone on to make exemplary careers as astronomers, scientists, technologists and educators.

The achievements of and discoveries from IIA in the past fifty years span a wide variety of topics in observational and theoretical Astrophysics. Women scientists of IIA have contributed significantly to the growth and overall development of this institution, in terms of challenging research projects, mentoring students and producing a good number of brilliant and motivated astronomers, and also in terms of research publications.

This booklet is the outcome of an initiative taken by the Gender Amity Cell of IIA to acknowledge and celebrate endearing life stories of IIA women scientists and engineers. We had invited them to recount their research experiences and personal impressions during their affiliation with the

Institute. The overwhelming response has resulted in a collection of articles which we are now happy to share with broader audiences.

The compilation here is largely autobiographical accounts of and by the women members associated with IIA in the past and the present. The emphasis has been on the journey of the author in science & astronomy, and not on the detailed account of their research. In these pages, you will find glimpses of their ideas; ethos that brought them to astronomy and astrophysics; values they uphold and the message they would want to pass on to the next generation.

While flipping through these pages, readers might feel that the articles, with their fascinating content, could have been longer! We take the entire blame for restricting the page length of individual articles purely on technical grounds. A longer version, we hope, could be presented in the future!

Last but not least, we are deeply grateful to all the authors who readily agreed to share their stories for this collection. Furthermore, we will miss those who could not send their contribution due to hasty schedules and pressing deadlines.

Hope you will enjoy this ebook. Happy reading.

Bengaluru,  
March 30, 2021

Aruna Goswami,  
Maheswar Gopinathan,  
Ravinder Kumar Banyal

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## *Acknowledgement*

We would like to take this opportunity to thank all the contributors for making this book a reality. The book would not have been possible without the dedicated support of many. All the members of the Gender Amity cell have been particularly enthusiastic about this initiative, we thank them for their extended support. Special thanks to the Director and the Dean of IIA for their support and encouragement in bringing out this book. We are thankful to many others for their goodwill and support.

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## Annapurni Subramaniam

*Inspired by stars and the night sky*

*Professor and Director, Indian Institute of Astrophysics, Bangalore*

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I am currently an observational astronomer and my broad research areas are stars and galaxies. My childhood days were spent in a not-so-remote Palakkad district, Kerala. I grew up in an Agraharam where the tamil brahmin community lives. As a child of under 10 years, I remember staying awake to watch Lunar eclipses, when my father would be in the temple. I also remember using an umbrella (with its innumerable tiny holes) to walk around during the solar eclipse, to watch the progression of the eclipse. We used to have a lot of power-cuts during summer nights and we usually spent the dark time playing on the street. At those times I always used to look up at the sky and tried to identify stars. In college, I joined a library which used to get the newspaper *The Hindu*, which had a night sky column that appeared every month. I used to lie down on the floor and identify constellations with the help of the newspaper cutting.

When I was doing my BSc., Halley's Comet appeared (1986). I was very curious to know more about it and made sure that I watched it till it disappeared. I used to get up early in the morning to study, as our university examinations used to be during the very hot summer months. I always used to notice the patchy/cloudy appearance near the tip of the Sagittarius constellation, which would be there every morning in the same place! I did not know that was part of the Milky Way and I was





looking towards its center! All of these were very motivating, apart from my liking the course in Modern Physics which had a good coverage of particle physics. I was very attracted to the areas of study of the Universe and particle physics by the time I completed my Masters.

Having completed my Masters from a Government college, when I passed the IISc. entrance test (to my surprise), I chose three departments in which to attend the interview. My first choice was the Joint Astronomy program. The Indian Institute of Astrophysics offered me a PhD fellowship and I joined the PhD program in August 1990. This was indeed a dream come true for me. My friends were very curious to know what it was all about. I did not have any reply, but in my heart, I knew I would enjoy every bit of it.

The first time I learned Fortran programming was in the computer center in Kavalur. This was right after my course work, and I had gone with Prof. Ram Sagar to perform a computation that was part of my project. I learned the required skills in a single week and the computation was complete in about 10 days! My observing runs in the Vainu Bappu Observatory were between 1991 to 1995. I used the 1.0m and 2.3m telescopes for my studies. We used to carry books (text books and writing

books), large spool tapes and all other essentials for a week-long stay and travel by Matador vans, which are infamous for their noisy and bumpy rides.

Never in my student days did I feel that I was looked down upon because I am a girl. The faculty and the staff were friendly and helpful. The observations in the night in the telescope were quite tedious. It was physically quite taxing, as we used to perform guiding on the telescope as auto-guiders were not there. Pushing and climbing ladders were part of the night, along with finding things around the telescope on the observing floor. I still fondly remember sitting on the catwalk and looking at the sky in the middle of the night, sipping a cup of tea.

The journey was indeed enjoyable, but not without hurdles. I had to convince my parents, particularly my mother, that I would take up night time astronomy. She was concerned about my staying at night alone in the telescope. But, when I took her to Kavalur and shared my excitement with her, she realised that it was my passion. Again, my parents-in-law did not understand why someone should struggle day-in and day-out to write research papers with meagre salary. I had to explain and share the excitement one gets in doing research, which cannot be bought using money.

These days as a Professor, I work with a lot of young students. It is something I enjoy. The questions posed by the young smart students who are new to astronomy are sometimes big eye openers. It also helps to save myself from getting outdated, as one has to get constantly upskilled with state-of-the-art tools

and skill sets in astronomy. When one is passionate about something, it is often forgotten how much time and effort went into it, without realizing. It is thus important to follow your passion and I am happy that I did.



## Anshu Kumari

*Postdoctoral Fellow, University of Helsinki, Finland*

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My fascination towards learning new things started at a young age when I started reading the educational monthly digest called Wisdom. During my school days at Jawahar Navodaya Vidyalaya, I read Wings of fire by great scientist and our former president late Dr. A. P. J. Abdul Kalam. I was very inspired by this autobiography and I decided to become a scientist at the age of twelve. I joined women's college, Jaipur for Bachelor of Technology in Electronics and communication. Later in my graduation, I realized that I am more inclined towards continuing my studies after engineering. So, I applied for a few IITs and some research institutes for masters and PhD. I was not particular about astrophysics before joining Indian Institute of Astrophysics (IIA), Bangalore. I joined IIA as an integrated M.tech PhD student in 2013 through IIA's written exam called IIAST and an interview. I remember distinctly the interview panel asking me why I want to pursue astrophysics with an engineering background.

To that I had replied, because I am curious about stars. I didn't know at that point that in future my research would be focused on our nearest star, the Sun. The first few months of M.Tech coursework was done at University of Calcutta, where the main focus was on optics and optics for optical telescopes. It was a bit difficult in the beginning to grasp the concepts as I was from an electronics engineering background. The late-night sessions at the library and the group studies with my batchmates really helped a lot to bridge the gap. After the course work, I visited IIA's observatories to do internships. This was the first time I saw big telescopes for



astronomical purposes. I joined Gauribidanur Radio Observatory (GRO) for my M.Tect project, where I designed an instrument to monitor the Sun. I continued to work at GRO for my PhD after my M.Tech with Prof. R. Ramesh and Dr. C. Kathiravan. The GRO is located at an isolated place away from city noise with one of the most beautiful sunsets I have seen. I was the only female in the group, and I was also the first female PhD student from IIA to work at GRO. My group members and supervisors never treated me differently because of my gender. During my PhD, my supervisors emphasized that it is equally important to work independently, and at the same time, publish one's work so that the people in the research community know you and your work. They always encouraged me to attend workshops and conferences which helped to collaborate in India and abroad and expand my research horizons.

During my PhD, I worked on designing new instruments for observing the solar corona and the study of solar radio bursts and associated phenomena which affect the space weather. My PhD was a combination of three main aspects: - instrumentation, observations, and analysis. I had an internship opportunity for three months at ASTRON, the Netherlands in the summer of 2018, where I was introduced to a lot of solar radio people by my advisor. I definitely think this was one of the biggest

opportunities I got during my PhD. In the last year of my PhD, I guided a few internship students for their projects, which I think helped me to become an independent researcher. After five years at the observatory, I was ready to write my thesis and submit at the University of Calcutta. I had applied for postdoctoral positions at a couple of research groups in India and abroad. I joined the Space Physics group at the University of Helsinki with Prof. Emilia Kilpua to work on modelling the solar eruptive events after my thesis submission. This work is different from what I had done during my PhD, which was mostly instrumentation and radio observations. The reason behind joining this project for future work was my willingness to learn modelling and numerical simulations to understand the physics behind these massive solar bursts.

During my few years at IIA, I have realised that PhD is not easy and not all PhD scholars are super smart, some of them are really hard working and they get results in return. PhD is more about self-learning and self-development, and the last time a PhD researcher is taught something is during their coursework. I can say that my PhD journey was an incremental improvement, and I will always be grateful to have the opportunity to be associated with IIA.



## Anupama G C

*Senior Professor and Dean, Indian Institute of Astrophysics, Bangalore*

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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

TMT, NLOT, etc. There is more to do and more to achieve. A career as a scientist never ends.

I have had my share of recognitions – President of the ASI, a young scientist award, Fellowship of two academies, been an invited review speaker in national and international conferences, member of several national and international committees, etc.

But, the most satisfying achievements are my research work, collaborations, and not to forget the students I guided and mentored. I have been lucky in being able to guide some of IIA's best students. There, of course, have been ups and downs during the long journey, but I would like to keep the ups and forget the downs!



## Anupama K

*Engineer-D, Indian Institute of Astrophysics, Bangalore.*

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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.





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.



## Anusha LS

*Postdoctoral fellow, Max Planck Institute for Solar System Research, Gottingen, Germany*

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First spark of interest in astronomy lit in me when I read a chapter on stellar evolution in high school. It was beautifully taught by our science teacher who also through his teaching style sowed a dream in me to become a researcher. Later, the practical decision to take up research as my career was motivated by my elder brother getting into a Ph.D. in experimental physics. My association with the Indian Institute of Astrophysics started when I joined the 2-month summer project program during my M.Sc. holidays to work with Prof. K. N. Nagendra. He was a great source of inspiration. His unique style of guidance by already introducing me to the advanced research topics strengthened my dream to become a researcher. The fruitful time I spent at IIA during summer project is the key reason for me to take up astrophysics as my career.

My association with IIA continued when I joined IIA as a Ph.D. student again to work with Prof. K. N. Nagendra. The intensive and brainstorming courses taught by experienced researchers at leading research institutes in Bangalore laid the foundation for my astrophysics career. The coursework introduced me to a vast ocean of subjects while the streamlined thesis topic took me deeper into the interesting topic of light polarization.



In addition to the academic excellence of the faculty at IIA, worth mentioning are the facilities such as library, stores, canteen, hostel and co-operation of the administration staff in various departments which all helped in a great way to have a smooth academic life at IIA. Further security at IIA made sure we had a

safe working environment particularly when we worked late in the night. I am indebted to IIA and its immense contribution in my academic career. I take this opportunity to thank IIA and wish the best for its effort in continuing to cultivate many young astrophysicists to the world.



## Aruna Goswami

### *Chasing the Elemental Connection: My Journey as an Astrophysicist*

*Professor, Indian Institute of Astrophysics, Bangalore*

Nestled in the misty hills of Meghalaya, is its capital Shillong, a beautiful and somewhat sleepy (at least in the early eighties) hill station. The Government Girls High School, Shillong (established 1886), from where I did my schooling, was quite reputed and sought after, but was obviously not so well connected to the ivory world of science, at least in those non-internet days. My college education was also in Shillong: Saint Mary's (Girls) College, one of the oldest catholic colleges founded in 1937, and Lady Keane College, the first women's degree college in North East India, established in the year 1935. I still cherish the care and dedication of the teachers in school as well as in college. But it was in 1983, when I joined the Department of Physics, Gauhati University that I had an introduction to research. It was still pre-internet, and pre-laptop days, and information on research was scarce.

Here, I received a lot of guidance from Prof. Hiralal Duorah, who later became my doctoral advisor. My journey as an astrophysicist had begun! I was naturally excited about my PhD topic that involved studying the formation of elements at the end states of stars. However, doing research

on a topic like nuclear astrophysics was not easy then. The highly sophisticated stellar evolutionary codes that incorporate thousands of nuclear reaction cross-sections and reaction rates, involving a large number of elements of the periodic table and their isotopes, together with astrophysical processes of stellar



evolution available today, were not accessible in the early eighties at my university. It was still an era of punching cards!

A break came in the form of an invitation to present our work at the General Assembly of the International Astronomical Union, held in Delhi in 1985. There, I met Prof. Ramamdurai of TIFR, Bombay, an expert in the area of nucleosynthesis, who later shifted to Indian Institute of Science. A collaborative interaction developed to understand the astrophysical sites of occurrence for gamma ray bursts.

After submitting my PhD thesis, I spent a couple of months at the Ooty Radio observatory studying morphology of supernovae remnants with Prof. T. Veluswamy. I came to IIA, Bangalore with a CSIR fellowship. Prof. Kameswar Rao, my mentor at IIA was an observational astronomer and it was at this time that I was introduced to optical observational astronomy. In those early days I accompanied Prof. Sunetra Giridhar for observations using the 1m telescope of the Vainu Bappu Observatory (VBO), Kavalur. Later, we collaborated on various other topics including the search for metal-poor objects using the OMR spectrograph attached to the 90 inch Vainu Bappu Telescope. Together, we found many new potential metal-poor stars, believed to be stellar relics from the early Galaxy.

My first visit to VBO, Kavalur, with Dr. A. V. Raveendran, was memorable for a very non-astrophysical reason! As we proceeded to our respective accommodations at LAB B, taking the narrow pathway, with both sides covered with tall bushes, I saw a few snakes crossing the narrow path. Before this, I had never lived in a forest area and had never seen snakes at such close proximity. Some people, who used to go there for longer stays had told me how one day they saw a python swallowing a deer, a short distance from Lab B. Another memory of visits to Kavalur was identifying stars and constellations while going for dinner to the canteen and on our way back to the observatory. During those days it was also not uncommon to have wild elephants visit the observatory campus; on such occasions we were escorted and taken by vehicles to the canteen and back.

Following this, a two-year stint as a research associate at IIT Kanpur was memorable and a cherished one. This was where I had my first serious teaching assignment as a Teaching Assistant for a quantum mechanics course at the postgraduate level. Meeting the demands of the inquisitive minds of the classroom was a challenge and I learned much by the time I moved back to IIA in 1993. A turning point in my research came when I visited Institut d'Astrophysique de Paris (IAP), C.N.R.S., under a CSIR/CNRS bi-lateral cooperation program and began a

collaboration with Nikos Prantzos of IAP. Our work on Galactic chemical evolution is one of the earliest works in this niche area, and received wide readership and acclaim.

Over the years, I have been active in a number of national and international collaborations: ‘The Belgo-Indian Network for Astronomy and Astrophysics’, ‘Indo-Thai bi-lateral cooperation program’, to name a few. On the observational front, spectroscopic studies of carbon stars and understanding their characteristic spectral properties have been one of the core areas of my research. Our discovery of a hydrogen-deficient carbon (HdC) star HE 1015-2050, was the first recorded discovery of a rare HdC star with the Himalayan Chandra Telescope. My recent works with my PhD students on metal-poor stars and Galactic chemical enrichment are aimed at understanding some aspects of the early Galactic chemical evolution.

For the past several years, I have also been deeply involved in various organizational works of IIA with roles like Chairperson of the Board of Graduate Studies, of the Group Committee ‘Stars and Galaxies’, of the Grievance cell, of the Gender Amity cell, and at times, as a member of various other committees. While such a broad spectrum of responsibilities certainly limited my

research time, the experience gained by shouldering such responsibilities, not only widened my exposure and strengthened my ability, but also helped me grow as a person with self-confidence.

I have been fortunate to get opportunities to take an active part in many developmental projects at IIA. Participation in projects like the proposed large optical telescope, Thirty Meter Telescope (TMT) and Mauna Kea Spectroscopic Explorer (MSE) have always been rewarding. I have been involved in the development of the TMT Detailed Science case, and also served as the editor of the Chapter “Exploration of the Milky Way and nearby galaxies” of the TMT Detailed Science cases -2015. As a member of the science team, I have contributed to the detailed Science Cases of the Mauna Kea Spectroscopic Explorer, and contributed to White Papers.

With its broad spectrum of facilities and capabilities, IIA is now rising from strength to strength, and has emerged as a premier research institute of international eminence. The coming years will be very exciting for IIA, and I look forward to IIA’s scintillating contributions to astronomy and astrophysics.



### Athira Unni

*PhD Scholar, Indian Institute of Astrophysics, Bangalore*

During my masters in physics, I got an opportunity to work in ISITE, ISRO Satellite Integration and Test Establishment) as part of my masters project. My very first step to the endless and beautiful subject. There I met Dr. Shyama who was my supervisor in ISITE. Working with her greatly influenced me to take research as a career option. I also got an opportunity to visit IIA with her. I was so excited. I roamed around the institute the whole day. Had lunch in the canteen, and visited the library. Students were playing on the ground in the evening. I wished to be there for some more time. The very next year I joined IIA as a PhD student.

I didn't have much idea about astronomy before I joined here. As time progressed I began to gather interest in my work. This institute has played a major role in shaping me as a better researcher as well as a better person.

The freedom which I got from my guide Prof.Sivarani helped me to talk to knowledgeable people in my field of interest and collaborate with them. The beautiful part of the institute is that most of the faculties and students are approachable and supportive. That is what makes the institute homely.

Coming to my area of work, exoplanet science is taking baby steps in India. I am also trying to be a part of that. My main work can be categorized into exoplanet atmospheric studies as well as the study of exoplanet host stars. In the host star part we are





mainly looking at the planet induced activities and possible abundance differences with respect to the nearby field stars. In addition to that we are also interested in understanding the importance of carbon abundance in the planet host stars. This is because carbon plays an important role in the dust chemistry of the protoplanetary disc where the planet forms. Coming to the exoplanetary atmospheric studies we are doing low and high resolution transit spectroscopic observations which includes understanding the possibility of using smaller telescopes facilities of IIA for the transit spectroscopic observation since most of the ground based observations are carried out using bigger telescopes. If we can use smaller telescopes (which are easy to access and more in number) that will be a good contribution to understanding the exoplanetary atmosphere. We are also looking at the high resolution transmission spectroscopy from KECK-HIRES for a couple of objects to characterize Na in the exoplanetary atmosphere to understand the possible exogenic contribution.

Improving the quality of work from students will improve the quality of the institute. One thing which I can suggest for the better performance of IIA is introducing the essential basic tools to the students during the course work itself. That will be very helpful. Conducting talks and colloquium on a more regular basis in all fields of astronomy and discussions on scientific paper writing will be good. Because the language as well as presentation skills are important to convey the results to the audience. There should be regular faculty-student interactions to get an idea about the work we are doing in the institute. Outreach activities can be more regular and more students should come forward to participate. I believe non academic activities also have an important role for improving the performance of students. So there should be some support and opportunity for sports and cultural events.



### Bhargavi SG

*Independent Researcher, Bangalore*

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I am an astronomer graduated from Indian Institute of Astrophysics (IIA). I am happy to share my beautiful journey on this memorable occasion of the Institute's golden jubilee year. I have been associated with IIA for nearly three decades from 1989 in various capacities: project assistant to regular Ph. D. student, post-doctoral fellow and visiting scientist with breaks in between. I had a memorable on-campus stay in the 90's while experiencing twists and turns both in academics as well as in personal life. At present, self-employed, I am often in the visitor's office doing single-handed research. My astronomical journey in IIA began in February 1989 by joining an Indo-US asteroid project. I was wait-listed for a Research Associate position that I was told would allow me to do a PhD and secure a long term position. My assignment was to develop an automated software to detect earth approaching asteroids in a sky-scanning CCD.

Memories of frequent trips to the observatory to use the computers, joyful rides in a rattling tempo-traveller, the breakfast of crisp, foot-long dosai, long walks, bird watching in the lush green hills and the walks on the 'cats-walk' of 90-inch observing floor are still vivid. By 1992 the asteroid project abruptly halted leaving my job prospectus in limbo! I was back in the classroom for JAP course work at IIA, RRI, and IISc in 1992-93, after securing 2nd rank in the national level entrance test. I felt strongly discriminated against as two male candidates were offered regular jobs ahead of me and allowed to do PhDs.



I chose the topic 'Searching optical counterparts of Gamma Ray Bursts' for my PhD. In 1997 the GRB astronomy saw a milestone using advanced techniques and round the world programs to rapidly search the optical afterglows were in full swing. Detection of at least one GRB afterglow was mandatory to write my thesis. But I had the disadvantage because the observatory had no e-mail or proper telephone connection to receive GRB alerts, no digital sky survey to prepare finding charts added to poor sky conditions. What accompanied in these challenging days was self-determination, moral support of a few well-wishers, colleagues and unconditional love of family. In March 1999 during my regular GRB observing run I had an opportunity to discover 2 new asteroids in a single CCD frame which re-appeared in the follow-up run after a month. It was indeed a fulfilling and proud moment in my life. I sacrificed two PDFs in

Europe and a long term position in the USA (European, H1B visa stamped), to stay back and work for Indian projects. Unfortunately, I never received an appointment letter after clearing the interview and being told by PI, I was selected as Astrosat PDF. This experience left me deeply hurt and isolated in the astronomy community. Though I stood all alone in my struggle, nothing whatsoever could snatch away my genuine love for astronomy.

Apart from astronomy, I enjoy trekking and mountaineering. To end my story on a happy note, I am proud to say that I am a 'Qualified Mountaineer' certified by the 'Nehru Institute of Mountaineering'. Healthy lifestyle and physical fitness took me to the summit of 20,000 ft Yunam peak (seen in the background of the picture) as recently as September 2019!



### Bhoomika

*PhD Scholar, Indian Institute of Astrophysics, Bangalore*

Since my childhood, I have always been captivated by the fascinating world of stars and planets. But I never thought of pursuing my career in astronomy at that time. I was always interested in moving to the medical field and wanted to be a doctor. But as I grew up, I found my interest in physics. I was encouraged to make my career in physics by the indulging ideas of physics that are associated with our daily lives. After M.Sc. completion, I didn't think about going into the research field, I was more inclined toward civil services. But getting a Ph.D. position at IIA gave a new direction to my dreams. Throughout my life I was always reticent, so during the initial days of IIA I was a little shy, but after some time I started enjoying research in the exciting field of astronomy. In the early days of IIA, visiting the observatory brought me a new passion to understand the fundamental observational principle of astrophysics.

I opted for high energy astrophysics as my research topic after 1 year of coursework. I worked on the gamma-ray emission from jets of Blazars for my Ph.D. thesis. I was very fortunate to have a supportive and courteous guide Prof. C. S. Stalin, who encouraged me from time to time to be a part of national and international conferences and to give talks. A supportive atmosphere in IIA helped me a lot to overcome the obstacles several times when I encountered research challenges and giving talks in front of the audience. I could discuss my research related problems with the students and faculties at any time. During my Ph.D. many national and



international conferences were held at IIA and I also attended many conferences in India and abroad. I have been able to connect with the many professors worldwide through these conferences and workshops.

The most engrossing aspect of IIA is the outreach culture, which has taught me to engage with children and society. There are numerous misconceptions circulated across society concerning the notion of astrology. Against these long-term notions, outreach helps society to reinforce its basic principles. I was fortunate to be a part of these outreach programs to some extent. The National Science Day and many other activities at IIA, such as public outreach on the occasion of the solar eclipse and lunar eclipse, which I thoroughly appreciate, inspired me to be part of the outreach.

I have had the chance to develop my writing skills. Although initially it was really difficult to write papers which I learned a lot over time. During my Ph.D., I found the Doctoral Committee meetings very helpful, which inspired me to work at the right time. Group meetings and journal clubs helped me to enhance my presentation skills. Extracurricular activities like the evening games at IIA ground kept me refreshed for the new day challenges after a long day of work. During my Ph.D., I enjoyed

volleyball and badminton a lot. I was also blessed to be the part of many cultural events organized at our guest house Bhaskara.

I enjoyed my Ph.D. journey at IIA tremendously. Research teaches us how to confront challenging circumstances calmly and how to communicate with individuals. Communication is an important aspect of research, and by having many kinds of support, IIA has significantly helped students to enhance the interaction around the world. Recently the JAI-AWSAR programme and IIA e-magazine DOOT came to light, inspiring many students to write articles on science and their experience. A research institution should have several such programs to encourage the students to be more intellectual.

But sometimes I felt that students and faculty presence should be increased in journal clubs and all kinds of talks which are held at IIA. Many times I found that people at IIA attend the talks only related to their research field. And the interaction between students and faculties should be increased so that students can come up with their own problems without any hesitation. Most of the students, based on feedback from the senior students, join the faculty for their research work. I would greatly appreciate it if the orientation program on the joining of new students can be organized more efficiently. This will help the students to pursue

their research work on their choice of interest. I would also like to shed some light on seating arrangements for the students in the office, which is not in very good condition. For a good

research environment, a well maintained and peaceful office space is truly required.



## Christina Birdie

*Librarian, Indian Institute of Astrophysics, Bangalore (Retired)*

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As a librarian retired from an astronomy institute makes me feel special and privileged as there are very few astronomy librarians in the country.

When I joined the library of Indian Institute of Astrophysics in 1978, little I had imagined that my entire career of librarianship would be spent there until I retired in 2014. As the years passed by It was more than a career for me in IIA, as this was the organization which encouraged me to advance my professional qualifications which enhanced my personal growth. Dr. Vagiswari was the librarian who had joined before me and she was the mentor and guide for me throughout my career at IIA. When I had joined, there were few observations I could recollect, like the tall wooden shelves in the library with unconventional height for browsing, the unrestricted library borrowing and the friendly astronomers, highlighting the uniqueness of the IIA library.

I was fortunate to learn the subject of astronomy with the help of the astronomers at IIA, who were always willing to guide me in classification and cataloging of astronomy books. I had joined the library in the pre-computer era and the communication was through letter writing.

Maintaining the card catalog and books acquisition registers was the practice in place. Waiting for the printed journals and astronomical telegrams to arrive through airmail without any delay was a great experience. Learning the traditional publishing process of KOB in the library was exciting.





The in-house built Binding Section relocated from Kodaikanal gave me the opportunity to learn the intricacies of conventional binding of books and journals. I was fortunate to have worked under Prof. Bappu for three years and he had inculcated the values of hard work and perfection in any work we had undertaken in the library. I was motivated by the subsequent directors to continue developing the library with professionalism. Prof. Bhattacharyya supported our decisions to remotely maintain field station libraries and also in the recruitment of additional library staff. We started the library Intern program to train the library school graduates to learn the library techniques & services.

Exposure to wide range of resources exclusive to an astronomy library like astronomical telegrams, IAU circulars, slides, microfiche/film, Palomar charts, conference proceedings, preprints, astronomical catalogs and atlases, observatory publications etc. gave me an opportunity to create appropriate tools & techniques to organize those resources. Simultaneously I also learnt to use NASA/ADS and astro-ph/arXiv-e-prints servers, the important astronomical information tools for effective retrieval of information.

Resource sharing among the libraries became an important requirement in the 1980s and a network of Astronomy libraries within India called FORSA was established informally to share the resources, and also as a discussion forum to exchange ideas. I had the privilege to collaborate with like-minded astronomy librarians through this forum. This network provided a platform to migrate from book delivery to article delivery system. As a nodal centre for resource sharing in astronomy, IIA library catered to non-IIA scientists, students and amateur astronomers in the country.

IIA library gave me many more strings to my library bow in the years to follow, as it had become necessary to make a paradigm shift to the technology oriented library.

In the mid 1990s, It was a challenge to transform IIA library from print to electronic, and also maintain the hybrid environment and I was a key player in this teamwork to accomplish the task smoothly. To mitigate the funds constraint and also to expand the access to more e-resources, I learnt new skills of sales negotiations for books & journals, sharing of resources through FORSA and other bigger consortiums like NKRC (CSIR & DST) to acquire new acquisitions with new partners.

In the international scene, the global astronomy librarians meet LISA gave us opportunities to showcase IIA library and its services for more visibility. With the support of FORSA and ASI, I had taken the lead to organize the 6th LISA conference in India at IUCAA in Feb 2010. We had organized a unique program 'Honouring the Mentors' to felicitate the senior astronomy librarians all over the world during the conference. I also served as a member of the scientific organizing committees of LISA conferences held in different places. It made me feel that the librarian profession is very diverse.

In the year 1999, It was the brainchild of Prof. Cowsik to induce us to participate in the Million Book Project which was the beginning for the creation of Digital Library of IIA and this had paved way for making the Open Access to IIA research publications easier through Institutional Repository. The process of making articles open access gave us opportunity to learn the different models of 'Green, Hybrid and Gold' access and the copyright protection to those contents. In the following decade IIA library saw an enormous change in collection of new e-resources and services, as the institute embarked on new projects and added new astronomical facilities. The skill to access new models of e-books & e-journals without DRM (which limit the digital content usage) was also acquired. Astronomy is data

intensive and to organize the big data and research publications, the Library took up the responsibility to deliver productivity statistics using bibliometric techniques.

In the year 2003, we made concerted efforts to trace the historical legacy of IIA and established a physical archive at IIA Bangalore for long term preservation of historical materials along with an aesthetic display. Prof. Hasan, as the director, gave full support in the creation of the archives with proper conservation techniques and in organizing the first ever workshop on Science Archives in the country. It was a learning process working along with Profs. N. Kameswara Rao, D.C.V. Mallik, R.C. Kapoor and several other astronomers who helped us to establish the archives. This also motivated us to collaborate and coauthor with the astronomers in writing research papers in the history of astronomy with special reference to IIA.

I also contributed to the welfare activities of the institute by assisting in various committees like Public Outreach, IIA publications, Gender Equity, Administrative reform and Organization of several conferences etc. IIA library played a key role in organizing theme based exhibitions of photographs during all the commemorative events of IIA.

In the personal front, I was conferred the first international PAM (Physics, Astronomy, Maths) membership award, followed by Sci-Tech division excellence award of Special Library Association (SLA) at Washington in the year 1998-99 in recognition of my contribution to the PAM-Asia Pacific Forum. In the year 2003, I was also conferred the 'Diversity Leadership Development Program' award of SLA. Taylor and Francis 'Lifetime achievement award for Professional Excellence in Library Services' was conferred on me in the year 2014.

In the year 2012, I was invited by the Springer and IOP publishers to be on their board representing astronomy librarians in the Asian region. We presented papers in many national & international conferences and also published research papers in

refereed journals, which added more visibility for us and IIA in the professional circle.

After more than three decades of service, I have a deep sense of fulfillment and satisfaction of contributing towards establishing a globally recognized modern astronomy library. This was possible because of the freedom to work and the support from the management, the directors, the users and most importantly my coworkers in the library, which I acknowledge profusely. Currently 'Library beyond building' has opened many opportunities for the future library personnel and IIA has the most conducive culture to support these new challenges to make the library a 'Smart Astronomy Library'.



## Drisya Karinkuzhi

*Senior Research Associate, Indian Institute of Science, Bangalore*

I am Drisya Karinkuzhi, currently a Senior Research Associate (SRA) under the CSIR – pool scientist scheme, at the Indian Institute of Science (IISc), Bangalore. I started my career in astronomy at the Indian Institute of Astrophysics (IIA) as a Junior Research Fellow in October 2008. Like everyone else, a PhD from a reputed institute was a dream for me too. But, astrophysics was not in my mind until I joined Calicut University for Post-Graduation. During that period, an observatory was set up at University, in association with IIA. In connection with this, many scientists from IIA were frequently visiting the university and presented their research, experiences, and plans, instilling an interest in me towards astrophysics. But still, I was not sure whether I could do that. It is not easy to get admission in these institutes and moreover, coming from a very conservative family in Kerala, staying away from home all by myself, was not an option for me.

But as Paulo Coelho said, If you want something in life, the whole Universe conspires for you to get it. I got married at this time and relocated to Bangalore. As I was constrained to be in Bangalore, it was not easy for me to get admission in Bangalore itself. I was shortlisted for interviews in many institutes but unfortunately, I did not get selected. But finally, after a lot of struggles, I got admission in IIA as a Junior Research Fellow with Prof. Aruna Goswami, in her project. It was a dream come true and since then I never had to look back.



The main theme of my thesis was to understand the production mechanisms or nucleosynthesis of elements heavier than iron. Stars in general are the producers of all the chemical elements, we know from the periodic table. We tried to understand the physical and chemical mechanisms involved in these processes, and how these elements are finally distributed in the Galaxy. Accurate abundance measurements of these elements are necessary to understand their origin, and that could be possible only using the high-resolution spectra of these stars. We made use of both the proposal based observations as well as different archives to acquire the high-resolution spectra for these objects. After successful completion of PhD in 2015, I continued in IIA for another year as a postdoctoral fellow. In 2016, I moved to the Institute of Astronomy and Astrophysics, University of Brussels, Belgium for my second postdoctoral fellowship. It was an excellent opportunity for me to work with internationally recognized experts in the field of both observational and theoretical stellar evolution and nucleosynthesis. I could expand my expertise to various state-of-the-art techniques for the processing and analysis of large data within the stipulated time. I also had access to most of the state-of-the-art theoretical models of stellar evolution and nucleosynthesis which are not

available to the public yet. My publications including the recent one on the intermediate neutron-capture nucleosynthesis process, the most debated neutron-capture process today, present many observationally derived constraints for understanding the nucleosynthetic origin of peculiar abundance pattern in low-mass stars, these are crucially needed to better understand the underlying stellar physics.

When I look back, I realize that I had to cross many hurdles to reach this point. There were many situations in which the question of choosing between career and family came up, but thanks to IIA, I was fortunate enough to be surrounded by strong women who had successfully overcome all these barriers. With constant support from my supervisor and also from my family, I did not miss anything, a research scholar would get during his/her PhD days. Even with a two-year-old, I never missed a chance of going for observations or even for conferences or meetings in India and abroad. I am very grateful to my mentors during the postdoctoral periods also for their constant support and encouragement, which helped me to manage the professional and personal responsibilities very well. Hopefully, I will be able to continue like this in the future also.



## Geetanjali Sarkar

*DST Women Scientist, IIT Kanpur*

My love for Physics and the desire to do a PhD 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 PhD, 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.



### Hema B P

*Independent Researcher, Bangalore*

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For now it is 12 years of association with Indian Institute of Astrophysics (IIA), Bengaluru. I was a graduate student and also a Postdoctoral Fellow at the IIA.

My love for astrophysics began in my school days. I was studying in seventh standard at the Jawahar Navodaya Vidyalaya, Tumkur, which is a residential school. One day a group of amateur astronomers from Tumkur visited our school. They had brought a nice telescope with them and had organized a sky watch program for that night. At that time, Jupiter and Saturn were visible in the night sky around 3 to 4 AM. We, a group of students, woke up at around 3'o Clock in the night and went to the school building to see these objects through the eyes of the telescope. Yes, we did watch for the first time the real Saturn with its fabulous rings around, and Jupiter with four of its satellites.

I was so amused to see the planets that are far far away from us. At that age I just couldn't imagine the size of the earth, so to look at these objects with a telescope was a great opportunity to attract the young mind towards astronomy. Since then I was very keen to study astronomy and was discussing with teachers on the topics. I used to read the science and astronomy magazines at school and college. I was so motivated to study astronomy that I was never in doubt to choose it for the higher studies. Though there were multiple job offers before I got into PhD, I was focused on taking up research in astronomy





as my career. I fondly remember my teachers, Prof. Ananda Kumari at Sri Siddaganga College for Science in Tumkur and Prof. B. A. Kagali at the Bangalore University who encouraged me to do project work. Hence, I took the entrance exam to join for a PhD at the Indian Institute of Astrophysics (IIA). With sufficient preparation and God's grace, I could clear the exam and joined IIA for a PhD soon after completing my master's degree in Physics.

Here starts my life at IIA as a Junior Research Fellow (JRF) on 25th July 2008. For the first year we had the course work held at the IIA, Indian Space Research Organisation (ISRO) and the Raman Research Institute (RRI) and Indian Institute of Science (IISc). It exposed us to the different fields of astronomy. I chose observational astrophysics for research. I joined Prof. Gajendra Pandey for my PhD project, with whom I also did my coursework project. My research topic included an extensive observational work. For my thesis work, I needed low-resolution spectra for the giant stars in Omega Centauri -a globular cluster in our Galaxy the Milky Way. The spectra were obtained from IIA's 2m Vainu Bappu Telescope at kavalur. I liked to go for observations, but I was finding it very hard to stay in the observatory for a long time. Initially, I found it a very lonely and isolated place but gradually got adjusted to that atmosphere. While I was shuttling

between the observations and IIA, Bangalore, it used to take me a while to get to regular research work at IIA. Mainly working in the night time during observations affects your life to some extent. Yes, it was a little hard for me for three years. During this time I was also taking observations from the Himalayan Chandra Telescope, remotely operated from CREST, Hoskote. Observing Staff particularly at VBO are very cardial and without whose support I could not have achieved my observing goals. My supervisor was very caring and has always supported me through all my ups and downs. Collaboration with the scientists at IIA and abroad were very helpful during the course of my research.

My experience at IIA has been an adventure, discovering my limits of patience, perseverance, and my inner strength. It completely transformed my life. All the difficulties we faced don't matter once you publish your first paper and when you defend your PhD thesis. PhD is not just completing your thesis but it changes your thoughts and the way you face life.

After completing my PhD I joined Physical Research Laboratory at Ahmedabad as a postdoctoral fellow. At the same time I was also offered a position as a Postdoctoral Fellow at the Indian Institute of Astrophysics, which I took up and continued my journey with IIA. Then I was carrying my baby. This is the time

when IIA was very supportive and gave full freedom of working from home. Not only in this phase, when my baby was small, most of the time I have worked from home. IIA was very considerate and I would always be grateful for that and also to my supervisor.

A very friendly and helpful staff at the administration, canteen, Bhaskara guest house, and my most wonderful friends made my life enjoyable at IIA. IIA is one such Institute which has nourished and supported the women scientists all through. Currently, though I am not employed at IIA, I continue to carry out research in astrophysics at IIA.



## Indrani Pal

*PhD Scholar, Indian Institute of Astrophysics, Bangalore*

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I am Indrani, a third year PhD student at Indian Institute of Astrophysics, Bangalore. I know that as an astronomer it is cliché to say that in my childhood the night sky full of stars always attracted me, but it really did and it still does. As long as I can remember I have always wanted to be a scientist. Once in my childhood I visited the M.P. Birla Planetarium in Kolkata and it was my first exposure to astronomy. I was mesmerized by visiting the astronomy gallery there and the speech delivered by a woman astronomer really inspired me to know more about the subject. But besides the night sky that always motivated me to explore it, I was also interested to study the complex systems within human bodies. So after finishing my secondary education I chose Biological Science along with Physics, Chemistry and Mathematics to pursue my higher secondary education.

But to be honest, during this time the joy that I felt solving different Physics problems immediately led me to the conclusion that, Yes , I want to be a physicist!! I have graduated with a Bachelor's degree in Physics from Lady Brabourne college Kolkata and was awarded INSPIRE scholarship by the Department of Science and Technology (DST), Government of India. I did my post graduation in Physics from St. Xaviers' college, Kolkata and received the Gold medal award for securing highest marks in my masters. During this time I had



an opportunity to do a project in Cosmology and this work strongly motivated me to pursue my research career in Astrophysics. After my post graduation I joined IIA as a junior research fellow in January 2018. In the first year in IIA we were offered to take a few extensive courses in Astrophysics. Throughout this year we were taught some advanced topics like General Relativity and Cosmology, Galaxies and interstellar medium, Fluid dynamics, Astronomical techniques etc. and I really enjoyed this IIA-JAP course work program that can be considered as one of the best in recent time. Along with the course work the students were also encouraged to do other scientific stuff like delivering and attending talks, presenting papers, writing proposals for the telescope time etc. and it really helped me to develop my communication as well as the writing skill. In the first year we were taken on a trip to Vainu Bappu Observatory (VBO). Over the whole night we have visited the Vainu Bappu Telescope, J.C. Bhattacharya Telescope and 1.0 m Telescope there and observed different astronomical objects. The experience I gained from visiting this field station is amazing and I will always cherish the memory of this trip. During this time I started developing an interest in extragalactic astronomy and

my thoughts inclined towards the study on the center of galaxies. The more I studied the subject I gradually realized that I would want to know more about active galaxies and pursue my research work on the studies of Active Galactic Nuclei (AGN).

The basic aim of my research is to study the hard X-ray spectrum of AGN. The nature of the X-ray emitting corona in AGN is manifested in the observed hard X-ray spectrum, and therefore from the detailed analysis of it one can infer different properties of the X-ray corona. I mainly make use of the NuSTAR (Nuclear Spectroscopic Telescopic Array) data to analyze the hard X-ray spectrum of AGN. Alongside I analyze the X-ray data using other instruments also and to do this I am learning new skills and tackling different scientific problems everyday. The main goal of my research work is to think independently and contribute something new to this progressing field from my end.

I am very much enjoying my life at IIA as well as my research work as an astronomer. It is a pleasure to be surrounded by such intelligent minds here. IIA always encourages the students to take part in different conferences, workshops,

schools etc. to help us to interact and make collaboration with other astronomers all over the world. I feel proud to be a part of this prestigious institute. I know that being a woman it is always challenging to choose such a career but I find most

of the people in this community very respectful towards each other. I am thankful to my family, friends, guide and colleagues for supporting me throughout this wonderful journey.



### Latha KVP

*Assistant Professor, Pondicherry University*

Stars and the night sky had always fascinated me, right from my childhood. I still remember my school days, when I used to drag my unhappy dad from bed, to a high altitude very shady looking isolated and unsafe places, early in the morning around 4.30 a.m. to see the planets and constellations, identify some stars, that would not be seen by late morning. It was an undeveloped hilly area behind our house, about 0.5 km away. Nothing would stop me from going there and watching the early morning sky, with a sky map in my hand. It makes me wonder about my madness and passion about astronomy and astrophysics, when I remember how I used to carry a skymap during my train and bus journeys, to look at the night sky from the outskirts of the city and fields, where the night skies were really clear. The wonderful Doordarshan programs like: Turning Point and excellent teachers in my school days, mainly ignited my passion in science, physics and in astronomy and astrophysics.

My interest in astrophysics grew stronger as I grew older and I felt that I have been chalked out for a career in Astrophysics. During my PG days in Hyderabad University, I was exposed to the wonderful field of particle physics, which further developed into a strong passion. With the emergence of another field of interest, I decided to choose either of the two areas for doing research. I was determined to get into prestigious institutes like IISc or TIFR. Life, they say, is stranger than fiction and it turned out to be so in my



case. Strangely, I landed up at IIA, an institute I knew nothing about except while applying for JEST exam. Even though I could not get into IIA through the JEST exam, which was quite disheartening. Luckily though, I was selected in the Centre for Theoretical Sciences (CTS) of IISc for research in particle physics. After joining IISc, I came to know more about IIA, and my passion in the field pulled me to join IIA under unexpected circumstances.

I stayed in IIA for a good amount of time, in the hostel. My hostel mates were like part of my family. Our elaborate yoga sessions, tea sessions and combined cooking spree are memories that I would always cherish. The wonderful thing about IIA is that it's the first place where I saw many women scientists and women students and also being very active in research. There were

tough times during my stay and all my IIA friends, IIA faculty, specially Prof. Prajwal Shastri and even the then Director of IIA, Prof. Ramanath Cowsik completely supported and comforted me when even my colleagues in my research group couldn't come forward. This goes to show how conducive IIA is, to women.

I am also happy to be still associated with IIA through its MOU with Pondicherry University, where I am a faculty at present. By this association, I am almost in regular touch with my teachers of IIA too, which is a great pleasure indeed.

I would like to end by saying that I really cherish my stay in IIA for all it has taught me and made me into what I am today. It was wonderful to be a part of it. On this occasion of completion of fifty years, I wish IIA, the very best in all its future endeavours.



### Margarita Safonova

*Visiting Scientist, Indian Institute of Astrophysics, Bangalore*

My name is Margarita Safonova, I am from Russia and I have been associated with IIA since 2006. I have done my M.Sc. in Sternberg Astronomical Institute, Moscow. That was my second M.Sc. with the first being in physical chemistry and biophysics. But the events of Soviet Union falling apart made experimental biology difficult to pursue and I went for a second M.Sc. in theoretical physics at Moscow University. When I was a baby, I dreamt of going to space – being a cosmonaut and all through my childhood science fiction were my favourite books. So, when opportunity came, I started attending astrophysics and cosmology courses in Sternberg Astronomical Institute affiliated with the University, and finally joined Prof. Sazhin, a cosmologist, for an M.Sc. thesis. I came to India to do my Ph.D. because of the worsened situation in Russia with science in general.

I completed my Ph.D. in Delhi University and, since I was already married to my husband – a former classmate, I followed him to Cambridge (he was doing the postdoc there) after my defense. After working there, and in Iran on visiting/postdoc positions, I finally rejoined my husband in Bangalore when he got the permanent position. I started looking for jobs and went for an interview in IIA, where I met professors Jayant Murthy and Prajval Shastri. This was my first exposure to experimental astronomy, before that I was only working in theory. I remember when I first visited Kavalur and saw the 2.3-





m telescope, I was so overwhelmed by it that I told myself: I should get some ideas and come to observe! Which I eventually did as the IIA allowed one to be a postdoc on a project and still pursue other ideas. Thus, my joining IIA, and astronomy in general, is due to an interesting (though possibly not the best) combination of circumstances. I am very happy to have had the experience of working in IIA in both experimental, observational and theoretical subjects.

I also took part in lots of outreach activities that IIA was conducting, as well as in other institutes and organizations. Initially, IIA was quite a leading Institute in this regard, though this was cut down quite a lot in recent years. I, of course, had lots of problems during my time in India, being a woman, a

foreigner, a mother during the Ph.D., and having grown up in Soviet times where there used to be total gender equality. Even during my graduate school, when I met my future husband, I experienced some discrimination. Some people even taunted my husband that he had two graduate schools, for himself and for me! Though I had different interests and even had a published paper before joining. This is a typical attitude in academics, so it is good that our interests now are totally different.

On a final note I would like to say that I love IIA and I love my years here, which were very productive. I also have many collaborators in IIA and many of them are indeed women. IIA seems to be a notable exception in this regard to other astronomical groups and institutes in Bangalore.



### Mausumi Dikpati

*Senior Scientist, High Altitude Observatory, NCAR, USA*

It is an honor and a privilege for me to be asked to write memories about IIA as a female scientist. While I have many good and unforgettable memories about IIA, which I like to cherish during my leisure, my recapitulation here would involve intimately-interlinked memories of both institutes (IISc and IIA). I was a JAP (Joint Astronomy Program) student, working jointly in IISc and IIA during 1989-1995. Although my PhD advisors were two male professors (Prof. Choudhuri, IISc and Prof. Venkatakrishnan, IIA), from whom I learned a lot of solar magnetohydrodynamics, as a female grad-student I was more connected with female professors, Profs. Vinod Krishan (IIA), Chanchal Uberoi and Chanda Jog (IISc) who had important influence in shaping my professional career. Prof. Krishan was my role model. During my PhD, I got the golden opportunity to observe her closely, specifically I learned how to dive into the unsolved scientific problems, maintain the focus until the

problem is solved, and to convey the new discoveries boldly and confidently. I was fortunate to be mentored also by Prof. Venkatakrishnan, Prof. Saxena and Prof. Gokhale. Often it used to bring an awe-struck silence in me to observe Prof. Gokhale, who is so humble despite being a scientist of high stature. I certainly learned from him how to respectfully treat every scientific contribution from colleagues and collaborators.

A particular incident, which sparked my confidence to be an independent scientist, is worth mentioning here. At the end of



the predoctoral course, I was doing an observational project with Prof. Venkatakrishnan and Prof. Saxena. The project involved an optics of a quarter-wave plate, which I received from IIA optics lab. However, I was obtaining the results that would be the characteristics of a half-wave plate, not a quarter-wave plate. Obviously I was struggling, thinking I had been making some mistakes. After a week, I requested Prof. Venkatakrishnan and Prof. Saxena to check my results from the interference patterns, and they both were surprised, because the results were really proving that plate to be a half-wave plate. That plate was received from the instrument-vendors and was mis-labelled as a quarter-wave plate. They cheered me a lot for discovering that indeed that was a half-wave plate, not a quarter-wave plate as labelled.

Many of my contemporary fellow students and postdocs became my close friends, with whom I spent countless pleasant moments, not only in scientific discussions, but also in IIA cafeteria and the tea-stall across the road. I am still connected with many of them, and have been continuing close collaboration with Dipankar (now the Director of ARIES, Nainital). Two years ago I visited him, when I was greeted by many of my

old friends and colleagues – a nostalgic moment that brings fond memories.

After receiving my PhD in 1996, I left Bangalore for my postdoctoral research at HAO/NCAR, Boulder, Colorado, where I have been continuing my research career, currently as a senior scientist. Till date, there remain various obstacles for the women in science and in almost all STEM professions. I feel fortunate to be able to associate myself with the IIA environment comprising many excellent professors as well as brilliant students and postdocs, from all of whom I learned a lot.

To close with a sweet memory of success, I like to mention that in 2007 I met many IIA professors at Ahmedabad, during the diamond jubilee anniversary of the PRL. I was honored to give an invited talk there, but more honored to receive the appreciation from the audience, which made me feel that I have been able to successfully demonstrate what I wanted to be. That was a very precious and touchy moment of my life, which strengthened my belief that forging ahead with science is liberating. Wish all the best for all the past, present and future women scientists at IIA and elsewhere.



### Meenakshi P

*PhD Scholar, Indian Institute of Astrophysics, Bangalore*

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I came to know about Indian Institute of Astrophysics through my uncle Diwakar. He is a very compassionate person who used to support and encourage me to pursue my career in research fields. I got a chance to work with Dr. P. Sreekumar at ISRO satellite center, Bangalore as a part of my M.Sc project. The period I spent at ISAC provided me the opportunities to understand more about the research in Astronomy. The interaction with the researchers at ISAC helped me to know better about IIA and the research facilities provided by the institute. In December 2015, I happened to see an advertisement for the position of junior research fellow (JRF) at IIA under the DST project. I applied for this position and attended the interview and I got selected. My journey at IIA started on 23rd of December 2015. I started to work on the DST project under the supervision of Prof. Aruna Goswami. The project was based on the estimation of the surface chemical composition of Carbon-Enhanced Metal- Poor (CEMP) stars.

The work was quite interesting and I was so excited to participate in the observations at Vainu Bappu Observatory, Kavalur and CREST campus at Hoskote as a part of the project work. Frequent interaction with my guide helped me to enhance my knowledge in the field and I began to gather more interests in my work which was a big turning point in my life. My interest towards the subject inspired me to register for Ph.D. In 2016, I registered for Ph.D in Bangalore university under the guidance of Prof. Aruna Goswami. My work includes the estimation of the abundances of various elements in CEMP stars and the interpretation of the observed abundances to



understand the possible formation sources. CEMP stars are metal-deficient objects that show enhancement of carbon. Substantial number of CEMP stars also exhibit enhancement of neutron-capture elements. The abundance anomalies exhibited by these objects have drawn considerable attention and promote many spectroscopic studies. The origin and the production mechanism of carbon as well as the neutron-capture elements in CEMP stars are not clearly understood.

The institute has played an important role in shaping me as a better researcher than I was before. Various facilities provided by IIA also supports my growth in my research field. One of the important things that an institute should provide to their students is to ensure their safety at their working place as well as at their hostels. I personally feel secure and safe at IIA. However, I would suggest that it would be better if there is a frequent interaction and meeting with the students regarding the problems if they are facing any. It will help to ensure the safety of the students especially for girls.



### Mousumi Das

*Associate Professor, Indian Institute of Astrophysics, Bangalore*

I remember being drawn towards Astronomy many, many years ago when I was in class 8 or 9. It was a combination of Physics and the night sky that attracted me towards the subject. When I was in school there was no internet, so my exposure was limited to reading popular science books and news articles. A book I remember appreciating was Narlikars' "Structure of the Universe"; reading that book not only gave me a rudimentary understanding of stellar structure, it also made me realise how important Physics was for the overall understanding of Astronomy. Keeping Astronomy in mind I studied BSc. with a honours in Physics from Presidency College in Kolkata (which has since become Presidency University). My college had a very political environment but the Physics department had some very good professors such as Prof. A. K. Raychudhury. They were not only excellent teachers, they also made us realise the beauty of the subject as well.

I went on to do a masters in Calcutta University and finally joined the Joint Astronomy Program (JAP) in the Indian Institute of Science. It was during coursework that I first started visiting IIA, as many of our classes were held there. It was really a great time for me, because I not only enjoyed the subject, I also liked the environment such as the library and the rose garden. But most of all I loved reading about galaxies, and especially their dynamics. In IISc., Astronomy was studied as a theoretical subject and so it was only from visits to IIA (and also RRI) that I learnt about the exciting



observational aspect of Astronomy. I did my Ph.D under professor Chanda Jog in the JAP at IISc. One thing that I learnt from her is that theoretical astrophysics has to be studied along with observational astronomy, especially for galaxies where the different physical processes can only be traced using multi-wavelength observations. It's from her that I understood the importance of connecting theoretical models with data.

After completing my PhD, I was a postdoc for several years. I wish it didn't work out that way, I would have preferred to have got into a faculty position much earlier on. I was initially a postdoctoral fellow (PDF) at RRI for 2.5 years (1997-1999) and then briefly at IIA as a visiting fellow for 8 to 9 months in year 2000. Then I was a Kerr postdoctoral fellow at the University of Maryland (USA) for 3 years and then continued as a research associate for another 2 years. I returned to Bangalore in 2005 as a research associate in RRI and then I joined BITS-Hyderabad in for a little over a year as an assistant professor in the Physics department. That was a very tough period for me but a real eye opener as I had to teach. I realised that teaching was one of the best ways to understand your subject (something one's professors always tell us, but when we are young we never listen!) I had the privilege of teaching some very smart students who asked many questions. That put me back in touch with basic

physics, something we often forget as we delve deeper into research. Finally in December 2010 I joined IIA as a Reader i.e. assistant professor. The reason why I mentioned the above struggles in the last paragraph is that many of us face such troubles either during PhD, PDF or faculty search periods in our careers. We have to retain our passion and try not to get frustrated. Doing science is not easy, and we have to always be open to doing teaching as well (this is something Virginia Trimble told me in Maryland).

My years at IIA have been very productive and I have learnt a lot. The environment is good for science because unlike most private universities the students and faculty are not continually pressured to show output. However, I think more discussions, meetings and open debate would help improve the environment even more. Students especially should be more active in asking questions and challenging what seniors and faculty propose as explanations. I myself was a timid student, that's why I strongly advise everyone to be more vocal about their work and questions. Last but not least I would like to talk about gender issues that I have faced throughout my career. Of course women in India face gender discrimination in all fields. In science I have been expected to keep quiet, and when I started my first PDF I was often told that by doing a job I would be neglecting my

children. When I applied for faculty positions I was told by many people that (1) I was expecting too much – I should do research but not think of it as a career, (2) that I was taking away a “man’s job” and that (3) maybe just teaching was a better career, a research career was perhaps expecting too much. I think most women have to hear these comments when they apply for

faculty positions. But once I joined IIA I am happy to say that I did not feel the gender discrimination so much. Of course I have experienced a few cases of gender discrimination but that has really come down over the years. I think having more women faculty at IIA really helps maintaining the balance and reducing the gender discrimination issues.





## Nancy Narang

*Postdoctoral Fellow, Rosseland Centre for Solar Physics, Oslo*

As a young girl, I would get amused by the vastity of the universe. When I was used to looking up at the stars, twinkling, some dim, others bright, my thoughts would be filled with great amazement, bewildered by such a beauty of nature. I believe this fascination with the stars at a young age built curiosity in my mind, which grew further and destined me to pursue Physics and Astrophysics in my higher studies. During my high school education at Rajkiya Pratibha Vikas Vidyalaya in Delhi, my interest in Physics sparked. My physics teachers at school, Girija Shankar madam and B. P. Singh sir always motivated me to follow my dreams of becoming a scientist in the field of Astronomy and Astrophysics. Finally, I would like to mention the name which needs no explanation, who is the role model of many young students, source of great inspiration for all scientists in India, Dr. A. P. J. Abdul Kalam. His whole life reflects the persistent hard work that has always induced my passion and dedication towards science.

After completing my Bachelors in Physics and Masters in Astrophysics from the University of Delhi, I joined Indian Institute of Astrophysics (IIA) to pursue my dream of becoming an astrophysicist. I believe this was the major stepping stone of my research career in Astronomy & Astrophysics. IIA, as one of India's premier research institutions, has a very apt environment, infrastructure, and expertise to perform high-quality research. The Unique combination of observational, theoretical, and instrumentation research conducted at IIA provides its students a good and balanced exposure to all sub-fields of Astrophysics research and related



science. My research interest developed towards our own life-giving star, the Sun, and I started working with Prof. Dipankar Banerjee for my PhD thesis. I thank Prof. K.E. Rangarajan for cultivating my interest in solar physics research through his lectures at IIA.

During my PhD at IIA, I addressed the long-standing problem of "Solar Atmospheric Heating" by exploring the role of small-scale features observed in the solar atmosphere in its mass and energy cycle. I primarily used the observations from international space-based solar telescopes and collaborated with eminent scientists from China, the US, and Europe. Such collaborations have given me a great professional experience to build good research networks worldwide. At IIA, not only I learned a lot about our Sun and performed high-quality research, I developed a scientific mind-set and competent research aptitude. I believe these skills will become the building blocks of my career in Astronomy and

Astrophysics, which will help me to develop a strong research profile.

IIA has always been standing tall in generating, supporting and motivating women astrophysicists. It has always been a matter of immense pride for all female scientists in India that this premier research institute of astrophysics research in India is led by the two women scientists, Prof. Annapurni Subramaniam (Director, IIA) and Prof. G.C Anupama (Dean, IIA). Prof. Annapurni and Prof. Anupama have always been a great inspiration for many young female astrophysicists in India. IIA has consistently provided better opportunities for women scientists in India, which has improved gender balance in astrophysics research. I believe IIA will also continue its efforts, through its various outreach programmes, to inspire young girls to pursue science in their higher education and follow their dream career path.



## Pallavi Saraf

*PhD Scholar, Indian Institute of Astrophysics, Bangalore*

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I am Pallavi Saraf, a second year PhD scholar at the Indian Institute of Astrophysics, Bengaluru. It is a great pleasure to me that IIA-ga-cell has invited me to write a short description of my life and present experience at IIA. Now I will start narrating my journey from a kid to a PhD scholar at one of the premier astrophysics institutes of India, IIA, Bengaluru. 1995, May 18th is the day when I stepped my feet in Sundargarh, Odisha, a small place of the beautiful world called Earth. Everyone was happy, of course, I did not know but when I grew older my mom used to tell me that when I was born, everyone was happy. My father admitted me to a private Odia medium school namely Sri Aurobindo School. After completion of my schooling, my father was in a haste situation whether to send me to a private college or a government college for secondary education.

Finally, after a lot of discussions, he sent me to a government college named Govt Women Jr College, Sundargarh. There exactly, after interaction with many good faculties, I came to know the real meaning of science. As time passed, my curiosity toward science also inclined sharply. With an interest in science, I opted to pursue BSc honors from Govt College Sundargarh. There I secured 3rd position at the university level. After that, I pursued MSc in Physics from Ravenshaw University, Cuttack.



To be honest, science is the only subject I have enjoyed a lot as a school kid or a college girl or even today. I used to participate in school and district level science exhibitions. I have won first prize twice for the best model in the district level science exhibition. I always love asking questions like 'Why' and 'How' during my science exhibitions. My interest in science goes in a meaningful direction when I choose to study physics in my bachelor's and master's. During these days I learned how to approach and solve problems systematically and meticulously.

During my MSc days, I used to discuss with my classmates and instructors about how to clear NET, GATE, and other national level exams and do scientific research. After that, I cleared the national level exam and got the opportunity to research at the Indian Institute of Astrophysics, Bengaluru.

When I was a kid, I used to think like the Sun is inside the earth and we are also living inside the earth. This doubt \_rst time came in the 3rd standard and cleared in the 6th standard that we are not living inside earth rather we are living at the surface of the earth. Interesting! There had been a lot of such events that fascinated me toward astronomy and astrophysics. For example, going out to see a rainbow after the rain, thinking of falling from

Earth if I walked in the same direction, thought of moving all the astronomical bodies around Earth, twinkling of stars in the night, the news of god-particle at that time and gravitational waves.

My first visit to IIA was on 26th December 2018 for the PhD interview. After completing my interview, I returned to my home. I reached home in the morning of 28th December and the same day I got the interview result that I was selected. I got the admission deadline 4th - 7th January. So I had only 3-4 days to spend with my parents and go back to the IIA. In IIA, my first day was very interactive. The first person I interacted with was the BGS person, Mr K Sankaranarayanan. He is a very helpful person. He introduced me to other staff and students in IIA. All the students were helping me. For me, the main problem was communication because I am from the Odia medium. All my schooling, college, graduation and post-graduation are in Odia medium. I mean all the books I was using were in English but the professors usually explained all the concepts in Odia. So, initially when I joined, I was facing difficulties in speaking English. Sometimes I had the question in my mind but because of an English speaking problem, I could not even ask the professor. Later I used to clear my doubts by asking my friends and seniors in Hindi only. My roommate, Annu Jacob, helped me a lot in my

hard times. She always talked to me in English for my betterment. But with time all the problems went and now I have nearly completed two years at IIA. Now, sometimes, I think that I joined IIA yesterday. The time is passing so fast. My overall

experience at IIA is good and hoping to be good in the future. The only thing I would like to suggest is that it will be very helpful for the non-English medium student if they can get some sort of English speaking sessions.



### Piyali Chatterjee

*Reader, Indian Institute of Astrophysics, Bangalore*

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I have been a Reader at the Institute since 2015. My primary research interest is in the area of computational solar physics. I have a two decade long experience in developing numerical codes for solving problems in astrophysical plasma using high performance computing. I am proud to be the first woman developer to become the owner and steering committee member of the open source and multi-user scientific software, the pencil code which is used by a large community of astrophysicists, chemists and planetary researchers across the world. I love creating simple models to address unsolved problems in solar physics and believe that numerical experiments require as much ingenuity and effort as experiments carried out in a state-of-the-art laboratory. A faculty position at IIA has given me the freedom and resources to pursue this passion. After completion of B. Sc (Physics major) from Mumbai University with a gold medal in 2000, I scored a 100 percentile in the JEST examination in the same year.

Subsequently I joined the Physics Department at IISc for their flagship integrated-PhD program and was awarded the Kumari L A Meera award for being adjudged the best Integrated PhD student in 2003. I am also a Shyama Prasad Mukherjee CSIR scholar. I obtained my PhD in 2007 from the Indian Institute of Science (IISc) for my thesis on understanding the solar magnetic cycle using flux transport dynamo models. After my PhD, I held several post doctoral positions abroad including at NORDITA (Stockholm), High Altitude Observatory (Boulder) and University of Oslo (Norway) before joining IIA.



## Prajval Shastri

*A Journey Spanning Four of the Five Decades*

*Professor, Indian Institute of Astrophysics, Bangalore (Retired)*

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It was a lovely morning in the spring of 1982. A cool breeze blew through the open corridors of the Indian Institute of Astrophysics (IIA), as I was eagerly waiting for the Neighbourhood Astronomy Meeting to begin. It was my first week in Bengaluru as a PhD student, having joined TIFR's radio astronomy group after course-work in Bombay. Soon, Srini (G. Srinivasan) was at my side. Amazingly, he recognised me from an earlier encounter when, as part of TIFR's "Bharat Darshan" tour of its country-wide centres, we had visited the Raman Research Institute (RRI) and spent an enthralling couple of hours with him. An invigorating chat typical of Srini ensued in the few minutes that were left for the meeting to begin. Wonderful talks followed in the meeting, including those by the then students Anantharamaiah, Vivekanand and Ashok Pati.

What also stood out for me was the camaraderie of the "neighbourhood" and the incisive questions by the then Director, Vainu Bappu, at every talk. It was a memorable first

encounter with IIA! Attending the Tuesday colloquia at IIA was the norm throughout my PhD. There were outstanding talks by astrophysicists from around the world. The auditorium was always packed, and the Director, Jagadish Chandra Bhattacharya always sat in the front row with pen and note pad, fully engaged,



always with questions. This tradition of the Director and the faculty, setting everything aside to engage with scientific talks seemed to have been Vainu Bappu's legacy, and was of course the norm in the west too. I missed this when I returned to IIA as a faculty. The weekly colloquium visits also paved the way for building a relationship with the IIA library. It was run by Vagishwari and Christina Louis, who totally conformed to my experience right from college days, that librarians are a different breed - they are always eager to share their turf rather than guard it. In those pre-digital days, IIA was the first in the city to get the Monthly Notices of the Royal Astronomical Society. More importantly, although TIFR did have a library, as did IISc, what I thought of as real "library space" was only at RRI and IIA: where human voices quietened, the companionship of books and journals silently reigned, and the mind automatically walked into the small special world of one's question of the moment. Those days, what is now a 30-second long search on NASA/ADS needed hours of ploughing through the thick Astronomy and Astrophysics Indices, followed by the bound journals. The focused quiet hours spent with these companions, with only the chirps of the crickets and birds in the background, are among the most serene and happiest that I can remember from my PhD days. I got introduced early to the Vainu Bappu Observatory (VBO) because I gate-crashed into Bhattacharya's 'techniques'

course in the Joint Astronomy Programme, and he generously let me join the associated field trip to VBO. It was a thrill to attempt spectroscopy with the 40-in telescope, chatter away sitting on the cat walk when it clouded up, go to bed right below the telescope and ride up and down on the platform of the 90-inch telescope which was just being constructed. Even later, during my decades as faculty at IIA, experiencing the science-prioritised climate of VBO was a highlight. The utterly respectful dedication and warmth of the observatory staff made work at the telescope a thrill, even during the nights that one got clouded out. The stamp of the founder-Director Vainu Bappu was unmistakable, setting a high bar in how a climate that respects science and scientists, regardless of their gender, could be fostered in an observatory in India. Soon after my joining IIA, the accreting supermassive black holes that I researched emerged from being a quirky minority to those at the centre-stage of galaxy evolution. Mentoring students against this backdrop provided for an exciting time. Fulfilment came in the form of the land-mark PhD theses that they all produced, and also in most of the interns going on into astrophysics PhD programmes around the world. An exciting venture was the four Astrostatistics Schools that I ran with Sabyasachi Chatterjee and Jogesh Babu of PennState University, bringing outstanding statisticians to the VBO campus to create a learning environment for a cutting-edge topic. The



whole range, of astrophysics students, post-docs and faculty benefitted, and the prodding to run more in the series has never stopped since. The International Year of Astronomy 2009 had the then Director Siraj Hasan as well as the Deans Harish Bhatt and Ajay Saxena putting their weight behind our initiatives. While many IIA staff participated with vigour, we were also able to build solid partnerships with science communicators, amateur astronomers, teachers, theatre artistes and many more. IIA therefore surpassed itself in impact and reach, which continued into Kalpaneya Yatre 2010 and the Transit of Venus 2011, and

has lasted even to this day. Astrophysics will remain fascinating. It has now become an enterprise in which national borders and disciplinary boundaries are dissolving. Therefore, more than ever before, excellence in research needs a nurturing learning environment that is collaborative rather than competitive. Gender inequity is a symptom of it being otherwise. The workplace climate needs to be transformed by building transparency and collegiality, and by freeing mentoring of patriarchy. Then, the full research potential of the enterprise is bound to be realised.



### Pravabati Chingangbam

*Associate Professor, Indian Institute of Astrophysics, Bangalore*

My first association with the Indian Institute of Astrophysics was in June 2005 when I visited the Kodaikanal Solar Observatory. I went there as a tutor for quantum mechanics for the physics summer school that was organized by Prof. Vinod Gaur. At that time I was a postdoc at the Harishchandra Research Institute, Allahabad. Apart from enjoying tutoring and interacting with the students in a serene and beautiful environment, I was awed by the scientific history of the place and went back inspired.

Fast forward to 2010 when I finally decided to apply for a faculty position. It was not surprising then that the previous short but inspiring association served as a beacon and IIA was high on my list of preferred places to join if I got the chance. I was fortunate enough to get an offer. After sifting through diverse perspectives and advice that I received from friends and supportive senior colleagues I decided to join IIA.

Previously I had had no experience with astronomical observations. The prospect of being part of an institute which controlled several observing facilities, and interacting with colleagues who build astronomical instruments, carry out observations and process the data was compelling. I was also eager to learn about the multitude of questions, particularly about the smaller scales of the universe, that my colleagues address and the methods they use to find answers. On the flip side I expected that I would be pulled away from my moorings in theoretical physics.



My academic journey has been following a winding road. I started out studying fairly abstract quantum mathematical physics. Since then I have been following the urge to connect what I learnt during my Ph.D. with the physical processes in the universe. This first led me to study how to model the universe during its early history. My interests, and nature of questions and enquiry have then evolved to encompass the later stages and the smaller length scales of the universe, as well as development of new methods for data analysis. This personal evolution has been influenced in no small part by discussions with my colleagues and friends at IIA, particularly the much enjoyed after lunch discussion sessions at the so-called 'shady place'.

I was fortunate to find a few senior colleagues at IIA who provided much support and encouragement. I also found one pleasant surprise when I joined IIA. For the first time in my academic life I had several women colleagues. Till this time I had not given any thought to how the learning experience can be different in a place where the gender balance is less skewed than the places I had been to. It took me a couple of years after joining to realize that I was more at ease at the workplace. It is only with hindsight that I can gauge and appreciate the positive impact this factor had on my psyche by way of boosting my confidence.



### 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.



### Radhika Dharmadhikari

*PhD Scholar, Indian Institute of Astrophysics, Bangalore*

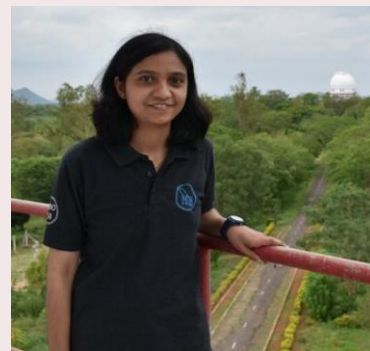
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"Even the stars have a life cycle; they take birth, get old and die just like Humans". As a school kid, this statement sounded unbelievable to me, and it filled me with curiosity. Thanks to my Physics teacher, she explained the complete life cycle of stars to us in an interesting manner. And not only this, but she also gave us tasks to identify different constellations and planets visible in the night sky. This was when I started building up interest in Astronomy. As I grew up, I learnt that learning astronomy would also help me to get some of the answers to the quest for the truth about the existence of life and the universe.

Further, during the 3rd year of engineering, I had applied for summer school at IIA, and this was the first time, when I got an opportunity to associate with the institute. I got selected for the summer school to be held at the Kodaikanal Solar Observatory, in the second fortnight of May 2017, but this was the time I had to make a difficult decision.

The summer school duration overlapped with my 6th semester practical exams in college, and I could attend only any one of them, either the exams or the summer school. All my college professors suggested that I appear for the exams, because if I don't then I won't be eligible to

participate in the upcoming placements in the 7th and 8th semester. I was in a deep dilemma about what to choose, astronomy was my dream, and this was the first opportunity I had got to attend a formal session on astronomy and that too at India's oldest Astronomical institute, I didn't want to let it go. At that time, it was very kind of the BGS chair Prof. Aruna Goswami,



who had called me personally to discuss the issue. Finally, after consulting with different people, I had decided to skip my practical exams and attend the summer school. This became possible for me only because my parents supported me with the decision, because missing the practical exams meant that I would get a fail mark on my report and also, now I would not be able to appear for any of the placements. In spite of all these drawbacks I decided to show up for the summer school, as it was my dream to visit IIA and do some project here. Finally, immediately after writing my last theory paper, I left for the airport and next morning, I reached the Kodaikanal Solar observatory to attend the summer school. There were many lectures covering almost every aspect of astronomy and it was a great experience to learn and interact with everyone. Attending the summer school not only gave me a new experience but also filled me with motivation, and I started working even harder to get admitted to the institute.

Finally, in the fourth year of my engineering I appeared for the IIAST (Indian Institute of Astrophysics Screening Test) exam and attended the interviews. The interviews gave me a chance to visit the IIA Bangalore Campus, this was the first time I was visiting there, and the memories of that day are still fresh in my mind. Finally, after clearing the interviews, I got selected for the IIA-CU

Integrated MTech.-PhD. Program. Joining the institute to study Astronomical Instrumentation was a dream come true for me. As a part of the MTech. course work, we got to stay in the "City of Joy- Kolkata". The one year of stay in Kolkata, not only enhanced my knowledge in academics, especially optics, but it also gave me a new perspective to look towards life, as I got to see and learn about a totally different culture there. Further, in the second year of MTech. we got the opportunity to visit the various field stations of IIA (VBO, KSO, Gauribidanur Radio Observatory and Photonics Lab). Visiting all the field stations gave us a deeper understanding of the practicalities involved in the various tasks, it helped us to implement and experiment with the theoretical knowledge of optics that we had learnt at the Department of Applied Optics and Photonics in Kolkata. After completing the internship, I started working under Prof. Padmakar Parihar for my nine month MTech project, entitled, "Study on Phasing of Segmented Mirrors using Dispersed Fringe Technique" and now I am continuing the same work as a part of my PhD project. To sum up, joining IIA was my dream and I feel fortunate to get the opportunity to study and work here. It is a place where not only the research facilities are great, but also the people around are very supportive and encouraging. Right from the time when I attended the summer school, until present, I have found each and everyone to be caring as well as motivating.



### Ramya P

*Postdoctoral Researcher, University of Texas Austin, USA*

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My earliest exposure to science as an enjoyable activity rather than a mere textbook study came when I was in primary school. I got an opportunity to attend the *Eureka Vigyanotsavam*, a science festival conducted for school students by Kerala Sasthra Sahitya Parishad in collaboration with the Ministry of Education of Kerala. The fun I experienced from this event encouraged me to participate in more of such science activities and festivals. I also invested some time to go through the children's science magazine *Eureka*. By the time I graduated from high school, I had set my dream to become a part of the fascinating world of science. In our society, any skill a girl acquired or any career track she chose was weighed based on its usefulness to ensure her a secured family life and nothing beyond that. Women were not considered major contributors in the field of science and hence research and development was not a popular choice for them to pursue.

I should mention how inspired I was, after reading the books *Wings of fire* and *Ignited minds* by our beloved former President and scientist A. P. J. Abdul Kalam, in which he calls on the Indian youth to break free of the submissive and complacent nature and dream big. I remember quoting his words during my conversation with the IIA interview panel “Dream dream dream. Dreams transform into thoughts. And thoughts result in action”. Also, I had a deep admiration for Kalpana Chawla, who excelled in her field defying all the prejudices in the society, traveled to the





opposite side of the globe and made her mark in history and in the minds of many.

My association with IIA started in 2007, when I joined the CREST campus of IIA as a Research Trainee, after finishing my MSc. Living away from family for the first time, making a lot of friends who come from different parts of the country, staying awake full night for doing the remote astronomical observations with the Himalayan Chandra Telescope (HCT), interesting and informative conversations with the astronomers ranging from students to senior scientists, occasional trips to IIA main campus to attend seminars, in every way it was the start of an amazing period of my life. I got the opportunity to learn about various science projects by assisting with the observations and also got involved in the photometric and spectroscopic analysis of supernovae. For the first time, I was exposed to the wonderful world of observational astrophysics.

The very next year, I joined the PhD program and it was a year of both hectic and enjoyable at the same time, flooded with lectures, assignments, exams, seminars and projects. I fondly remember those days spent traveling to IISc, RRI and ISRO to

attend various courses and labs and those sleepless nights spent in the IIA library reading and working on the assignments. When it was time to start working towards a PhD thesis, I chose an observational project which involved high resolution stellar spectroscopy and elemental abundance analysis of stars. Vainu Bappu Observatory at Kavalur, with its charming greenery, calm and peaceful environment, very experienced and cooperative research/technical staff and highly hospitable kitchen staff holds a special memory in my mind and I greatly enjoyed my observation sessions there. Further, there were tremendous opportunities for international collaborations which also contributed towards my thesis significantly.

IIA was full of opportunities offering a range of activities for our multidimensional development, along with providing a strong foundation for an academic career. It was a highly rewarding experience to participate and contribute in various events conducted by IIA, such as night sky watch, arrangements to witness eclipses and other astronomical events, National Science Day celebrations, outreach programs in schools preferably those in the rural areas in order to popularise science education, various internship programmes and workshops to attract and

nurture growing talents. I also got an exciting opportunity to work with the IIA-TMT (Thirty Meter Telescope) group for a couple of months in 2014, my last year in IIA as a student. Also, I greatly cherish the pleasant memories of my stay in the Bhaskara

Guest House, where we never missed any celebration. IIA transformed my life for the good and I proudly carry the legacy of the great minds who set this wonderful stage for the generations to come.



## Ramya Sethuram

*Project Scientist, Indian Institute of Astrophysics, Bangalore*

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My interest in Astronomy started very early on during my high school when I read Science topics related to the formation of earth, sun and solar system and chapters describing the sun-earth connection. It was while studying these chapters that a strong urge and liking to study more of astronomy started. I kept the urge and continued to grasp more knowledge on the solar system, constellations, night-sky visitors through newspapers, magazines and visits to city central libraries. It was during one of my PUC days at Vijaya College I had a chat with my physics teacher Mrs. Bhuvaneshwari and expressed my wish to take up astronomy as a career. Of several pieces of advice given to me by my teacher, the most important one was to concentrate on my Physics and Maths. She even suggested me to take up Bachelors in Science, BSc at NMKRV college, Bengaluru.

After finishing my BSc, I pursued my Masters in Physics at Department of Physics, Bangalore University. Two great teachers Prof. C. R. Ramaswamy and Prof. R. UshaDevi inspired me to learn Quantum and Nuclear Physics in more detail. With continued interest in Astronomy, I took up studying Nuclear physics as my

specialisation. After my MSc, I was selected into IIA as a research trainee to help astronomers in their night-sky observations using a newly installed 2m-HCT telescope. I was overjoyed that I would



be sitting behind the telescope observing various astronomical objects. I was deeply involved in all the operational aspects of the 2m-HCT for 2 full years.

With UGC/CSIR-NET qualification, I was eligible to pursue a PhD and did so with full enthusiasm with Prof. T. P. Prabhu on star formation processes in blue compact dwarf galaxies at IIA. After my PhD, I did my postdoctoral research work at Institut d'Astrophysique de Paris (IAP) on feedback in Quasars and at Shanghai Astronomical Observatory (SHAO) on various topics of galaxy formation and evolution. My areas of research expertise include galaxy formation and evolution, in particular, understanding formation and evolution of dwarf galaxies, low surface brightness galaxies and search for active galactic nuclei in low-luminosity systems through optical and NIR photometry and spectroscopy. I have spent a considerable amount of my career observing through the telescopes. Questions were often raised by friends, family, classmates regarding a women's safety if night-time astronomy is pursued as a career. Constant unconditional support from parents, husband and family helped me to continue my career in astronomy.

Currently, I am a Project Scientist for India-TMT at India-TMT Co-ordination Centre (ITCC), IIA, Bengaluru. I am also deeply

involved in the design and development of the Wide-Field Optical Spectrograph (WFOS), one of the first-light instruments to be installed at TMT.

Indian Institute of Astrophysics has been an encouraging and enthusiastic place for women astronomers. The Institute hosts a large number of women PhDs and faculty in Astronomy; one of the largest in the country. However, the cross-pollination of ideas across continents is at a minimum and we are in the age of cross-collaboration of research ideas. It would be a good idea to start say a Vainu Bappu Chair Professorship which is offered to a senior Professor/ researcher from abroad who is an expert in multiple areas of research e.g. instrument building, observational astronomy, modelling etc. with excellent publication record [say some one like Prof. Sandra Faber]; for a one year visit at our institute and allow many faculty, postdocs and Ph.D students benefit from his/her experience and also forge collaborations. To do cutting-edge science, we need cutting-edge technology or at least access to cutting-edge telescopes. I benefited from such a system in SHAO, China, where there is CAS PIFI Professorship and access to larger telescopes located elsewhere in the world.

The entry level of Faculty/ researchers at IIA can be made more diverse. There could be establishment of young independent research groups (aka Max-Planck) or 5 year Faculty positions (aka China), who are then given permanent positions subject to quality research output. I do not know of any such initiatives by

any other institute in India and I feel that IIA can show the way by such initiatives. This may also bring more vibrant research culture and fresh ideas into the institute at regular intervals and contribute to the quality of research.



### 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).*

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It was a summer afternoon towards the end of Ramya, Sireesha, and Ambily's PhD. 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 MTech-PhD 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

how to be an astronomer when I was in school. I didn't know of any undergraduate courses in astronomy, so between engineering and physics, I chose the safe option as per the society's standards then. Ramya, what made you study engineering instead of doing Physics?

*Ramya:* Aha! I had an interest in Aerospace Engineering but I didn't give AIEEE or JEE in 12th, I chose the closest branch of Engineering which had application in Aerospace, and finally I was drawn towards astronomy and instrumentation by the end of my Engineering. During the final year, I got to know about the MTech-PhD program in astronomical instrumentation at IIA, and I qualified GATE to appear for the interview. So Sireesha and Ambily, how was your journey from engineering to IIA? How did you end up choosing IIA for doing a PhD?

*Ambily:* In my case, looking at the syllabus of astronomy entrance tests, I realized that I don't know the requisite amount of physics to pass them. So I took up a job after my bachelor's. Sometime during that period, one of my friends had seen the advertisement for IIA's Integrated MTech-PhD program. That made me realize that there is still an option for me to become an astronomer. Sireesha: After +2 like most of my peers I joined an engineering course. My aim was to get a job as soon as possible. After

graduation, I got a job in a software firm. Even though I liked the job I realized that I wasn't fully satisfied with my job. I wanted to be an engineer at the same time I wanted to pursue a career in astronomy. That's when I found out about the integrated MTech-PhD course at IIA. I choose to opt for it. I spend many sleepless nights studying for the entrance examination. Finally, I achieved my dream. But after coming here I realised that the research environment has its own disadvantages and drawbacks, especially for women. Ambily, Ramya what are the challenges you faced during your PhD time?

*Ramya:* PhD was an enlightening experience for me. I worked on a project with multiple collaborations as my supervisors offered me a lot of individual freedom. Working with a diverse group of scientists from different countries, definitely provided an exposure regarding the research and development facilities abroad. I would call PhD as more of a self learning experience fuelled with a lot of discussions with supervisors, seniors and juniors. Being guided by a woman supervisor definitely had an impact on me in shaping myself into a strong and independent person. Compared to other astronomy research institutes in India, IIA has maintained a balance in gender ratio and you have a lot of women scientists to look up to and get inspired from.

*Ambily:* I must say I am lucky to have a highly supportive advisor and group. Apart from scientific and technical knowledge, other experiences in PhD were also crucial, like attending conferences, learning to communicate your research through papers and talks, working with collaborators from various countries and cultures, etc. It is a time where you learn to work independently and keep yourself motivated in research in spite of temporary setbacks. IIA is definitely a great place to be as a woman in science too; don't they say 'you can't be what you can't see'? So seeing a lot of women in all strata of power, doing some amazing science, has been quite motivating. But now, that doesn't mean that women, especially female students, never face any sexism or harassment, right? So how are you two's experiences in that aspect, and do you think we have done enough to address this problem as senior students?

*Sireesha:* I wish to tackle this question on two fronts. Personal and professional. On the professional front I believe IIA can do a lot in improving the research environment. The communication between different groups (theory, instrumentation and observational) should be improved. For example an instrumentation engineer can build an instrument only if the observational astronomer and theorist state their requirements. IIA should conduct more conferences or create opportunities for

the young researchers to interact with each other. During my PhD 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 PhD 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 PhD 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



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-economic class, sexual orientation, etc. Isn't it time we start talking about how IIA, and in general STEM higher studies, needs to be a more inclusive space for minorities, dalits, or LGBTQI people? Also, as most of us are often not well informed to handle all these discussions, maybe we should seek more external personnel in these committees to give orientations and to address any complaints from a neutral and professional perspective. The other thing that irked me the most was how many times students were considered irresponsible, and not treated more as colleagues. Don't you think it is kind of weird that students still addressed their more senior researchers as 'Sir' and 'Madam'?

*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 PhD, 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 and quiet. But I do agree all the field stations/observatories of IIA are truly amazing in terms of facilities and personnel. IIA has definitely become a major part of my both professional and personal life and I consider myself lucky.

*Ambily:* The PhD time was a remarkable period for me both personally and professionally. It is during your 20s that you start figuring out life, and find out what kind of a person you are and want to be. I am really fortunate to have spent most of that time here!



### Raveena

*PhD Scholar, Indian Institute of Astrophysics, Bangalore*

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I have always been interested in science and mathematics right from my school days. I get amazed by the explanation science has, for every phenomenon occurring in and around us. When I was a kid, I read the book “Wings of Fire- An autobiography of A.P.J. Abdul Kalam” written by Dr A.P.J. Abdul Kalam and Arun Tiwari. It describes Dr Kalam’s early life, struggle and journey to leading India’s space research, nuclear and missile programmes. That was the inspiration or boost I had in my childhood days, which upgraded my love towards science to the highest level. Gradually, I developed the passion of becoming a scientist and wished to meet Dr Kalam one day. I was completely shattered when I heard about his unfortunate demise on 27<sup>th</sup> July, 2015. I completed B.Sc in Physics from F.M Autonomous College, Balasore in 2015. Then I joined National Institute of Technology, Rourkela to pursue an M.Sc course in Physics from the Department of Physics and Astronomy.

During this course, I learned the basics of Astronomy which triggered my interest in the subject and it was then that I decided to carve out my career in Astronomy and Astrophysics. In the second year of M.Sc, I came across the M.Tech-PhD programme in Astronomical Instrumentation at Indian Institute of Astrophysics (IIA) for which the IIA Screening Test (IIAST) was to be held in December. I appeared for the test and got selected for the interview. When I cleared the interview as well, that was a moment of profound happiness for me and my family.



After I joined IIA in 2018, we had to go to Calcutta University, Kolkata for one year course work where we learnt optics and basics of image processing. Then we came back to Bangalore for a 3-months internship programme at various field stations of IIA. This period was again very informative and I got the chance to observe the Sun and the Stars through the telescopes at Kodaikanal and Kavalur, respectively. I got to work on mini projects related to CCD cameras at Kavalur, spectropolarimeter at Kodaikanal Tunnel Telescope (KTT), antennas at Gauribidanur etc. These experiences helped me immensely during the M.Tech Project which was based on the design aspects of a multi-slit spectropolarimeter for the National Large Solar Telescope (NLST). After the completion of M.Tech in 2020, I have joined PhD at IIA. I am presently working on solar spectropolarimetry under the guidance of Dr K. Nagaraju. I am also an active member of the editorial team of the Quarterly Magazine of IIA, "DOOT". The magazine includes articles on creativity and experiences of people associated with IIA, stories of the field stations of IIA, interview with one of the eminent scientists, various science concepts in simple language, review of scientific and technical publications from the IIA family.

The magazine DOOT is an initiative taken by the young researchers at IIA in order to compile the ongoing research works

of students and faculties, and convey them to people who want to pursue their career in astrophysics. More researchers of IIA should come forward to publish their ongoing work in the magazine. Similarly, the outreach programmes should be endorsed by the Institute on a large scale and it should be made mandatory for everyone at IIA to participate. I think these platforms will help in building quality of research at IIA and subsequently, attract more people for research at IIA. Basically, transparency of the ongoing projects and other administrative works at IIA should be developed. In this era of computers and smartphones, people from all over the world follow the research works at various institutes through their websites only. Therefore it is a necessity that each personnel's field of work and ongoing projects should be reflected and regularly updated at the IIA website. Also proper office space (with cubicles) and hostels should be established to accommodate more students who will be joining IIA in future. This is one of the important aspects, as ambience of the work space and the living space plays a major role to sustain good researchers at IIA. There should be a proper ground for sports like badminton, volleyball, basketball etc. which will help in eliminating the work stress and aid in building a healthy mind and body, which is again very important for every faculty or student or staff.



### Rubínur

*Postdoctoral Fellow, National Centre for Radio Astrophysics, Pune*

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Abba (My father) introduced me to the “Kalpurush (Orion)” and “Saptarshimandal (Big Dipper)” when I was in class two or three. I had the task to search for the three stars in Orion’s belt and seven stars of Big dipper. Being from a village in West Bengal, most of the time we had a clear night sky and it was amazing to see those twinkling stars. However, my real interest in astronomy came during my Masters degree at St. Xavier’s College, Kolkata where I had a specialization course in “Astro-particle physics”. This course gave me exposure to the basics of Astrophysics and I decided to pursue a PhD in Astronomy and Astrophysics. I visited St. Joseph’s College, Bangalore for a workshop during my second year of MSc where I got to know about IIA. I was selected through the IIA entrance and interview. The next five years at IIA were some of the best for me including all the ups and downs. The first year of course work gave us a better understanding of the various topics in astronomy and

astrophysics which helped me to choose my dissertation topic on “galaxy merger and binary/dual AGN” under the supervision of Dr. Mousumi Das. She, along with Dr. Preeti Kharb, an AGN and radio astronomy expert, helped me in developing my knowledge on various topics of galaxies and AGN and also supported me whenever needed. My PhD topic involves observations from radio and UV telescopes. From the beginning, Mousumi taught me to write the observational proposal for large telescopes like VLA, GMRT and UVIT while Preeti helped me in understanding radio astronomy. The environment of IIA also



helped me to have productive discussions about our work with my fellow students. I was also able to attend several workshops and conferences in different institutes in India. These meetings helped me connect with the larger scientific community in India and abroad.

My time at IIA has not only helped in improving my research skills but also helped me gain confidence in the English language and develop my views on several social issues. While I have not felt any gender discrimination at the professional level, it would be good to have occasional meetings where students can discuss it not only regarding the institute but also in terms of society. This can give them the courage to raise their voices if it happens at the professional as well as personal level. IIA gives exposure to several activities like outreach, sports, etc. However, it needs better infrastructure for sports. I also feel that IIA needs to organize more workshops in multiwavelength data as well as conferences on different topics. There should be some

colloquium on the general topics like “(i) Career options after PhD, (ii) How to write good research proposals, (iii) What are the factors important during PDF applications, etc”. The evaluation method like doctoral committee meetings should be a little strict in terms of research progress. Another difficulty I faced is with communications between the IIA and Pondicherry University. It is good to have one active co-ordinator in paper related work like submitting the registration and thesis related documents etc. I feel that there is a gap between the faculties and students which makes it difficult to talk about the problems faced by the individuals. This needs to be reduced by making more informal meetings where students would have the freedom to talk about their problems without the fear of getting judged.

Overall, I am very happy with my experience at IIA. When I look back, I appreciate how IIA helped me become what I am today and gave me the skills I need to pursue my research in the future.



### Sampoorna M.

*Associate Professor, Indian Institute of Astrophysics, Bangalore*

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I am a Theoretical Astrophysicist working at IIA. My research interests are in the highly specialized field of spectro-polarimetry with a focus on the theory and applications of polarized spectral line formation in solar and stellar atmospheres. The radiation received from stellar atmospheres is polarized due to resonance scattering on atoms and molecules. This polarization is modified by the magnetic fields via the Zeeman and Hanle effects. Spectro-polarimetry is a powerful and unique tool to diagnose the solar and stellar magnetic fields using polarized light. This tool is based on the theory of generation and transfer of polarized radiation in stellar atmospheres. It involves formulating and solving the polarized radiative transfer equation including the factors of atomic and scattering physics in the presence of magnetic fields. My interest in Astronomy and Astrophysics was kindled by my B.Sc. Lecturers, who motivated me to pursue a career in Astrophysics.

My first association with IIA was during my M.Sc. Physics course at Bangalore University (BU). The course curriculum also included Astrophysics as a general paper. Recognizing my interest in and inclination towards Astrophysics, my M.Sc. Professors introduced me to Prof. K.N. Nagendra of IIA, thus enabling me to study from the advanced material at this premier research institute dedicated to Astrophysics. I used to visit IIA library on some afternoons when there were no classes for the day at BU to study Astrophysics and



also prepare my notes for the Astrophysics general paper. These studies gave me a clear direction to pursue a career in Astrophysics. During my M.Sc., I also got an opportunity to do a summer project at IIA under the summer students program. In this project, I was first introduced to resonance scattering and Hanle effect and their use in determining the solar magnetic fields. Working through the physics of the Hanle effect, and studying some extensive review articles by Prof. Jan Stenflo, along with several interesting discussions with Prof. K.N. Nagendra, I got inspired to choose this field as my research area.

After completing my M.Sc. in Physics from BU, I qualified for the NET-CSIR JRF position at IISc under the Joint Astronomy Program. The first year of course work was taught by experts from different research Institutes in Bangalore including those from IIA, where I got familiarized with the research environment at IIA, its faculty and students. Subsequently, I joined IIA for my Ph.D. under the able guidance of Prof. K.N. Nagendra. Pursuing Ph.D. at IIA provided me with a solid foundation for my research career. This was possible because of the effective research environment provided by IIA. Indeed, IIA provides extensive research facilities and a conducive environment for front-line and cutting edge research, to its faculty and students alike. This

allowed me to complete my thesis within the stipulated time. Moreover, my Ph.D. thesis was awarded the Meera Memorial Medal 2008 of IISc for the outstanding thesis of the year in the Department of Physics, IISc.

After my post-doctoral research fellowship at IAC, Tenerife, Spain, I re-joined IIA as a Chandrasekhar post-doctoral fellow – a fellowship generally imparted to outstanding young scientists. As a Chandra fellow, IIA gave me the freedom to pursue my own research interests. I consider this as one of the most crucial aspects which makes IIA attractive to any one inclined to pursue a career in Astrophysics. Subsequently, I joined IIA as a regular faculty. Since my association with IIA, the constant opportunities, continued support and encouragement given to grow as a full-fledged scientist and pursue my research interests helped me to be awarded the NASI-Young Scientist Platinum Jubilee Award 2013 of the National Academy of Sciences, India (NASI), in the field of Mathematics and Physics.

IIA has been a women friendly employer, as seen from the representation of women faculty and students at IIA as compared to other research institutes in India. This tradition has to be continued. In my view, our tradition of giving freedom to

our researchers to work in the areas of their interest, should be continually nurtured, as this would make IIA more attractive to students and scientists alike. More importantly, this would allow all branches of Astronomy and Astrophysics to flourish at IIA. Inhouse, national, and international collaborations should be

enhanced to further increase our competitiveness. I also opine that our institute's computational facilities should be at par with or exceed those available anywhere to include us as one of the foremost research institutes.





## Shalima P

*Research Faculty, Manipal Centre for Natural Sciences, Manipal*

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The starry heavens with the twinkling stars and the moon shining yellow and gold in all its glory had fascinated me right from my toddler days. It was during those years when television had not made its advent in most households. In a remote village far from the madding crowd with never ending stretches of paddy fields, watching the heavens during clear nights was a fascinating experience. I recall my maternal grandfather enlightening me on different groups of stars (constellations) especially the Saptarishi and showing me the bright evening star etc. To top it all were interesting stories connected with these heavenly bodies which made me all the more drawn towards them. I remember sighting the Halley's comet and my grandfather telling me its history, starting from how it got its name and also about its sighting being considered a bad omen foretelling a calamity of a grave nature affecting the world at large.

During my childhood, I often got to listen to interesting anecdotes about the great scientist and visionary Prof. M.G.K. Menon, who was a close family friend of my maternal grandparents and his brief stay at my uncle's home in Mumbai during his Ph.D days. M.G.K. Menon therefore became my inspiration and role model to enter the field of Astrophysics. Moreover, it is noteworthy that despite being a girl child, no one in the family mocked these far fetched ambitions of mine, rather they encouraged me! And rightly so, since our family followed the tradition of women empowerment which runs in our



matriarchal family system. My mother was extremely supportive of my dreams and ambitions. So I got all the encouragement and support to take up any career I chose to pursue without imposing restrictions of any kind and I consider myself fortunate in this regard.

My initiation into Astrophysics took a decisive turn after my plus 2 when I started thinking seriously about getting into research in the field. My meeting with the then coordinator of IUCAA, Dr. Chellathurai and his career advice became a turning point in setting my path into this field. Following his advice I went on to do my Masters in Physics at IIT Madras. It was during this period that my first association with IIA started. I was selected to do a summer project at IIA and in those six weeks under the guidance of Prof. Harish Bhatt I took my first step in Astrophysics. What I noticed during that period was that the faculty and Ph.D students of IIA (who later became my seniors when I joined here for Ph.D ) were extremely helpful and kind.

During my Ph.D, our hostel felt so much like home and we were one large family. There were times when our seniors used to prepare mouth watering dishes which we got to savour gratefully, along with countless tea sessions accompanied by casual as well as intellectual conversations. In addition, the faculty and staff of IIA were also extremely friendly and always ready to help whenever the need arose.

What was unique about IIA was that this was a place which not only had a lot of good quality research being done but also several women scientists and students were actively involved in it. This goes to show that the environment at IIA is conducive to women researchers and does provide the support and encouragement we often need. To sum it up I really cherish my long association with IIA and I am really grateful to have been a part of it. On its successful completion of fifty years I sincerely wish all the very best for the Institute in the years to come.



## Shejeela

*PhD Scholar, Indian Institute of Astrophysics, Bangalore*

I always loved to watch the sky. The night sky, with its bright celestial objects, has fascinated me since my childhood. I wondered what makes the stars shine, why they are invisible in the daytime etc. I was eager to know the mystery about the beautiful phenomena of the sky that drew my attention. I was deeply impressed when I could learn a few facts regarding stars, galaxies, space stations, etc. in my school classes; my first and foremost introduction into the field of Astronomy, being unaware of the word "Astronomy." When I came to know more about it, I liked astronomy and wanted to be a part of it. I was so fortunate that I could study the astronomy and astrophysics course in both my B.Sc and M.Sc. Later, when I got the opportunity to do my master's project in astronomy, I realized my interest in this field and decided to pursue my career in astronomy. I came to know about IIA during my master's degree, and I joined here as a Ph.D. student in 2016.

Though I wanted to do my research in cosmology, I had to do a project in observational astronomy as part of the course work. So I joined Prof. Aruna Goswami. Once I started working with the team, I became interested in the work. So I decided to extend my Ph.D. in the same field. My guide, as well as the entire team, are very supportive and inspiring. This place has played an essential role in molding me. Most of the people here are very supportive, knowledgeable, and friendly, making me feel comfortable being here. When talking about my research field, I work in the field of metal-poor stars. My work is to understand the role of the metal-



poor stars in the chemical enrichment of the Galaxy through a comprehensive study of the surface chemical compositions of a selected sample of metal-poor stars. The origin and evolution of elements in the Universe are not yet completely understood. The chemical evolution of the Universe is a long-term process starting from the elements enriched by the exploding first stars that hardly contain any metals and progressing till now to the formation of the stars that contain 2 - 4% metals. Metal-poor stars are long-lived low-mass objects. They are mostly in their Main-Sequence and giant phase of stellar evolution. The atmospheres of most of these stars show enhanced abundances of neutron-capture elements. These old, metal-poor stars provide a remarkably powerful tool to investigate the chemical and dynamical evolution of the Galaxy as their least-evolved atmospheres preserve the true chemical imprints of the nucleosynthesis process that enriched the gas clouds from which they were formed provided the surface chemical compositions are unaltered neither by any internal mixing processes nor by any external influence. They help us to reconstruct the chemical

evolution of the elements. Our primary goal is to investigate the contribution of AGB nucleosynthesis to the Galactic chemical enrichment using metal-poor stars such as metal-deficient Ba stars, CH stars along with its more metal-poor counterparts, CEMP-s and CEMP-r/s stars. We are doing low- and high-resolution spectroscopic observations using IIA's observing facilities such as HCT/HFOSC and HCT/HESP; supplementing these observations by high-resolution data from SUBARU/HDS, HERMES/Mercator, and FEROS and UVES at the ESO in La Silla. My thought for the better performance of IIA is that it would be better if there are longer introductory sessions for the new students regarding the faculty here and their areas of work (IIA does conduct orientation programs for new students) so that the students will get better ideas of the research works going on in the institute. Another suggestion is that our website should show research interests and expertise of faculties / students / technical staff members, so that inter-department and interdisciplinary collaboration is practical and comfortable.



## Shylaja B S

*Director, Jawaharlal Nehru Planetarium, Bangalore (Retired)*

My first visit to IIA sometime in the early part of 1978, was for the interview, which concluded with questions like what is the distance from earth to sun, to explain an eclipse with a drawing and to name quantum physicists from India. Faithful to my M Sc syllabus, which puts C V Raman under spectroscopy, I did not include his name. My reasoning resulted in a loud laughter. Anyway, I got the order. The first assignment to make a clock with a 1 MHz crystal was easy; but it had to drift off by 4 minutes a day! Oh my God! Why? So began my lessons in astronomy. As a person who spent all of a quarter century of life in the heart of a city (a quiet, peaceful one then) the adventure to an observatory was a remarkable experience. For the first time in my life I was alone! I enjoyed this quiet solitude till 7:30pm and walked out to discover the starry sky (and I “discovered” the 40” dome!)

After a paradigm shift from electronics to observational astronomy, Prof JCB assigned me the task of recording lunar occultations. The magic of stars suddenly disappearing or popping up from nowhere was an enjoyable sight. The associated niceties were many. It would start with making a selection of the events from the list of SAO.

Then punching holes on a paper tape as a programme on TDC12 with a teleprinter, making and filling dry ice to the PMT chamber, checking the programme before the event, adjusting the clock listening to the Big Ben tune from BBC, converting the dump of numbers into beautiful graphs of diffraction pattern and so on.



The instrument counted photons every millisecond. The accretion discs of the cataclysmic variables were gaining popularity and so I caught them flickering at high speeds. I approached JCB for a route to PhD; he directed me to Prof. Bappu, who hardly had any time for me. He put me with K KScaria for learning basics of imaging which was enjoyable, and with TusharPrabhu for spectroscopy, which was really a tough job with photo densitometers and comparators.

In the meanwhile I got introduced to another instrument which was a very efficient combination of a spectrograph and a photometer by GSD Babu. The grating would move in steps to throw different wavelengths to the photometer. It had a nice interface with the tele-printer so that you had numbers to plot graphs. With GSD Babu, I used this for demonstrating new type of variabilities among peculiar stars and metallic line stars. The recurrent nova U Sco and later nova CrA showed the potential of this instrument for emission line stars. Prof. Bappu put me on a 20" telescope to produce a HR diagram of NGC 6231 using narrow band filters! I worked alone with the tall ladder, chart recorder and a clock. Prof. Bappu wanted me to study the emission lines of binaries such as Wolf- Rayet, RS CVn and the novae. The entire scheme of observations unfolded during the discussion at Kavalur and the next move was finalised. These trips

to Kavalur provided me opportunities to learn about old and new instruments. I am perhaps the only one to have taken spectra of the sun with Coude echelle spectrograph. I successfully photographed a sequence of lunar eclipse with M camera directly on photographic paper with a hand held card board shutter.

The solar eclipse (1980) was another exciting experience. Almost six months in advance Bappu himself called me and gave me all the details to educate locals in Kannada. Two days prior to the eclipse we (with Ramesh Kapoor and his camera) reached Hosur and then headed to Javalagere. Prof. Bappu put me on to a job which I thought I was misfit for - telling the school children, who came in batches to see the camp, about the eclipse.. The mesmerizing view of the eclipsed sun is still etched in my mind. The beautiful and clear skies of February were not to be lost. So, as soon as the eclipse got over I picked up the small cup used for making dry ice and rushed back to reach Kavalur by next noon. At 8 pm Prof. Bappu was discussing with me over the phone about the observations.

June 1982. I was through with about 75% of my observations. Prof. Bappu spent time on each of the graphs and explained the next step. I had to write a program and extract the emission variability by the time he returned from ESO.

August 1982, the whole institute was plunged into the darkness of sorrow. It was a very big jolt for me. I felt I was left somewhere in the middle of a dark tunnel. I remember all the senior colleagues who helped me with my thesis. Kameshwara Rao put me in touch with the stalwarts in the field - Dave Stickland, Gopal Kilambi and Robert Koch at the Delhi IAU in 1985. They all read my handwritten thesis and gave valuable feedback. Bangalore University delayed the letter for submitting the thesis for some formality on the demise of Prof. Bappu, I submitted papers to JAA to get valuable comments from the referees. I met them later at a meeting in Indonesia as they disclosed their identity - Peter Conti and Anne Underhill. Profs Abhyankar and Kapahi were the examiners for my thesis.

Prof K R Sivaraman included me for the study of comet Halley. I observed it continuously from September 1985 till May 1986 but for an imposed home quarantine in December when the prime minister visited. We observed other comets like Churyomov Gerasimenko and carried out all the necessary acrobatics on the

top of the tallest ladder as needed. Much later in 1996, I again got a chance to observe comet Hyakutake. My visits to Kavalur also gave some rare views of the sky like the meteor showers, zodiacal light and planetary conjunctions. One dawn in late October 1980, showed us Saturn deprived of rings - there was even an argument that by mistake the coordinates of Mars were put. JCB explained the rare sight we had witnessed - the disappearance of rings once in 15 years. One of the cloudy seasons we had a series of lectures by JCB on how to get distances to objects.

The flora and fauna of Kavalur are fresh in my mind. The peacock and peahen pair, yellow frogs, blue scorpions, snakes of different sizes, deer, many small birds and a rich variety of insects were common. But the encounter with a chameleon is etched in my memory.

Many young students used to join me in Kavalur. I distinctly remember a school boy (Nanda Kumar, CAUP Portugal) from Mysore. Many JAP students had joined me for their practical sessions. Arvind (Paranajpye) also used to join me and gradually grabbed the 20" all for himself and followed it to the Himalayas. My visits to IIA renewed after I joined the Planetarium. I took the help of the younger generation to learn IRAF, renewed my visits

to Kavalur with students whom I taught at Planetarium over weekends. The 1m telescope provided me spectra of stars which my students would decode to their understanding. I got spectra of Hyakutake, several asteroids, satellites of Jupiter and Saturn. The most interesting was that of the eclipsed moon. The library was a great attraction offering me the chance to translate a Kannada text dated 1874.

The website generously allocated a page for the Planetarium and I learnt managing it with monthly sky charts and other interesting events. With me the planetarium also found a special place for IIA staff. I requested a special set up for showing the sun to

students and the public. I requested for a beam splitter to show the spectrum and white light image - the prototype was tested at the Kodai museum by Samson. The construction of the spectrograph just sufficient to resolve the sodium doublet was taken up by Rangarajan; it fetched his team “the best poster” award in one of the ASI meetings. But alas, I had retired from the Planetarium by then.

I owe a lot to this great Institute, the senior and junior colleagues.

PS: *gender bias*? I never heard of it as long as I was there.





## Sindhu Pandey

*Postdoctoral Fellow, Aryabhata Research Institute of Observational Sciences, Nainital*

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My passion for astronomy and astrophysics began as a childhood hobby of stargazing and to find out why the moon followed me? I have been interested in science since my school days and chose science for my pre-university college. My interest was further nurtured by Prof. (Late) V T Bhuvaneshwari, who taught us physics during my 11th class. She was engaging during her lectures and also made sure we learnt physics outside class too, in our day to day activities. It was during this time that I got my first opportunity to visit the Indian Institute of Astrophysics, Bengaluru campus to observe the Venus transit event on 8th June 2004 and learn more about the astronomical event. In the same year, our college decided to take us to Vainu Bappu Observatory at Kavalur. The night sky at Kavalur and a large telescope (2.3 m) instilled in me to learn more about astronomy. I subsequently took up physics as one of the core subjects during my under-graduation.

I was disappointed to know that we did not have any course in astronomy or astrophysics until the final semester. In my first year of under-graduation, I learnt about a 100-hour astronomy course organised by M P Birla Institute of Fundamental Research in Bangalore and readily enrolled myself in it.

The faculty for this course were scientists from Indian Institute of Astrophysics, Bengaluru University and Raman Research Institute. Here, I got the opportunity to build my knowledge in the subject from the brilliant minds in the field. It was the turning point of my life, where I was determined to take up astronomy



as my career. I completed my M.Sc in physics from Bangalore University, but the path after my graduation into research in astronomy was not straightforward. I registered for M.Phil at Vellore Institute of Technology, which allowed me to get connected with the Indian Institute of Astrophysics. I am indebted to Prof. Tushar Prabhu, who gave me timely guidance to work with Prof. Annapurni Subramaniam for my M.Phil project. I developed a code to generate count rates and UV magnitudes in the ten filters for the stars in one old open cluster, M67 using the UVIT exposure calculator and later extended the work for two other old open clusters NGC 188 and NGC 6791. I further worked with a team to convert the code to an online software tool, (Bright Source Warning Tool) used to check if the field is observable by UVIT. This tool is mandatory to submit a UVIT proposal on ASTROSAT. I continued my research work for my PhD under her guidance on star clusters. Her patient guidance, constructive criticism and encouragement gave me a chance to understand and review my research work at each stage. At the institute, we had weekly group discussions and a

journal club that enhanced my knowledge in a variety of topics. The weekly meetings improved my communication and presentation skills. My research during my PhD focused on understanding the single and binary stellar evolution in the old open clusters. I have used data from the Ultraviolet Imaging Telescope (UVIT) on ASTROSAT, the first Indian space observatory to understand blue straggler stars in two open clusters, NGC 188 and M67. I am currently a postdoctoral fellow at the Aryabhata Research Institute of Observational Sciences. My work focuses on studying the exotic stellar populations observed in the star clusters. Indian Institute of Astrophysics has been a leading institute committed to research in the field of astronomy and astrophysics. The recent youtube channel of the institute has been promoting science stories and bringing eminent scientists on the platform that brings awareness to the public. The institute can further create a public profile through a science column in the daily newspaper, which can engage the general audience.



## Sindhuja G.

*Project Scientist, Indian Institute of Astrophysics, Bangalore*

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I have been interested in observing the sky from my childhood. Me and my father used to sit on the terrace and look into the sky and my father though he is not a graduate, he is very much interested in looking into the sky and reading some articles and books on stars and planets. He used to explain to me about what he read on stars and planets. That made me get excited and slowly I got interested in Physics and Astrophysics. During my tenth grade there was a chapter on Astrophysics in my physics book and I was excited to learn that chapter first though it was the last chapter. Thus, I have decided in my tenth grade that I will pursue my career only in Astrophysics. My mother and father supported me a lot. During my 12th grade, I visited the Physics department of Kamaraj University, Madurai to know what I need to study further to pursue my career in Astrophysics. The Physics professors there instructed me to take up bachelors and masters in physics.

Hence, I completed my bachelors in Physics. During my bachelors there was an advertisement in NASA living with star program called "Rock around the world" according to this program we need to send a rock from our locality to NASA and they will see if they are like the rocks on Mars by analysing it and I got a certificate from NASA in this regard. Then I joined Mother Teresa Women's University for my masters. I joined there, so that I will be provided with a project in Astrophysics,



because usually students of that university are sent to Kodaikanal or Kavalur for the projects.

Thus, my first association with IIA was in Vainu Bappu Observatory. I worked on the project entitled, "Determination of extinction coefficient of VBO, Kavalur". I used Image Reduction and Analysis Facility (IRAF) and performed the initial calibration of the data like bias subtraction, flat fielding and dark correction. Then I measured the extinction coefficient of VBO at R, G and B wavebands. Then, I have applied for many short visits and projects in several institutions and also participated in some even before my Ph.D. I have participated in short term projects at Raman research institute (RRI), ISRO Space Application centre (ISAC) and Space Application Centre (SAC).

I joined IIA for PhD in 2008, that is a dream come true moment for me. I worked on the Study of solar chromosphere using the Variation of Ca-K line profile with solar cycle phase. Then I joined Udaipur Solar observatory as a Postdoctoral fellow, Island worked on the study of reconnection rates and fluxes and light curves from the low and mid solar chromosphere. I got selected

for the DS Kothari Post Doctoral fellow, during this time, and I also got selected for the SCOSTEP visiting scholar program at NASA/GSFC. I worked on the study of the observational properties of coronal mass ejection flux ropes near the Sun. I felt very happy when I visited NASA, because from the time when I was sending rocks to NASA, I felt I have grown in my professional career and slowly reaching my goals. Currently, I am working as a project scientist in India's first solar space mission ADITYA-L1. I am happy that, during this many years of my research, I am able to collaborate with many experts of solar physics and explore different layers of Sun in different wavebands and thus contribute new results through my publications.

I will continue to explore all the layers of Sun in all wavebands using ground and space based observations. At IIA, it will be good if there are more opportunities like short visits, boot camps and short projects for students, that will encourage them to pursue their career in Astrophysics. It will be good if there is a creche facility in IIA, that will be helpful for women students and scientists.



I am Sioree. I am a PhD student at IIA working on the study of properties of Galaxy Haloes using Simulations and Observations under the guidance of Dr. Mousumi Das. I am currently in the third year of my PhD. My academic journey till this stage has been similar to a metamorphosis experience, with gradual and steady development of interest in Astronomy, especially in the last 4-5 years. My interest in Physics started growing in the 12th standard while thinking about problems in mechanics, which I found not only directly connected to the real world around me but also to the sky above. During my Bachelor's and Masters, the physics department in Presidency University organized various colloquiums regularly; a significant number of those were on Astrophysics and Cosmology topics. During the same time, I attended the Vaccations Student Program at IUCAA and visited GMRT and Girawali Observatory. This gave me the first impressions of astronomy research in a National Research Institute. It was an amazing experience.

During Masters, we had a Special paper in Astrophysics, General Relativity & Cosmology, and as a part of the course, we had 1 semester to work on a dissertation project. The undergraduate and postgraduate experiences at Presidency University, mainly the interactions with my mentors, teachers and friends, gave me the impetus to do a PhD in Astronomy and Astrophysics. The most incredible and academically enriching part of my life was when I was studying basic fundamental Physics. The happiness in understanding the basic concepts is hard to convey in a few sentences. IIA has provided me with the environment and



facilities to enlarge my vision and has made me realize how important Observational Astronomy is to understand the properties of the stars, galaxies and the Universe as a whole. One of the main goals of doing a PhD is to learn to identify problems addressable in a definite time frame, learn to do independent research, and collaborate with researchers to solve these problems. I found that these goals are not easy to achieve. Interest and curiosity in learning about new fields and techniques always act as fuel to the mind, but along with these interactions with faculties and fellow students also play a major role in academic development. With a large strength of faculties, students and engineers working in a vast area of research in Astronomy, Astrophysics and Astronomical Instrumentation, IIA provides great potential for academic development. Regular colloquiums and conferences arranged at IIA and neighbouring institutes in Bangalore is one of the enriching parts of research at IIA. Besides, IIA has multiple observational sites at different places in the country, which provides practical experience in Observational Astronomy. Additionally, visiting the telescope sites acts as a refreshment in the middle of research. I remember the first time I saw the Milky Way during a trip to the Kavalur Observatories. It's a wonder that triggers a chain of thoughts and ultimately makes us realize that even with our insignificantly brief existence, we dare to understand the Universe. It makes me

feel grateful. Speaking about personal growth and development, I have learnt a lot from my mentors, friends, and fellow researchers during different events and various discussions. There is so much to learn from every person around us. PhD is a very different kind of experience from what I have ever experienced. So many intelligent brains at work at a single place for a time of 5 years, a truly complex system. I want to make this time a good learning opportunity not only in the academic front but also by growing into a wiser person. Recently, I had some very nice opportunity to organize a Special Lecture Series through online video conferencing in which eminent Professors in IIA discussed essential topics with the students. This gave me a lot of confidence and inspiration to take up unfamiliar challenges. Also, organizing journal clubs has introduced me to some fascinating research works. What I have learnt is that one should not think negatively of challenges or hard times. Hard times are the one that actually builds us up. If we try to skip the problems, we will never know our worth. In difficult times keeping a birds-eye view to the problem has helped me a lot. I hope and wish to keep an open mind and keep learning new things.

Thoughts on how IIA can be made more attractive for students: .

- I think student-faculty interaction might be improved. For example, the Journal club may be a good platform to discuss various concepts and questions if there is active participation from students and faculties. Faculties could share suggestions with the students on how we can utilize this platform for more academic interactions. In this context, the BGS Student's seminar is a very nice step to increase the interaction and provide new perspectives to the ongoing research work of the students.
- I think it would be very good to be a teaching assistant for different courses. If this provision were there, it would be of great academic experience for students.
- The part of the course work that is conducted by IIA can be expanded more and regular classes by instructors is highly needed. From my course-work experience, I have seen that many lecture days are postponed, and it led to a partially covered syllabus at the end of course work. Especially for the subjects like Statistics and

Astronomical Techniques, a thorough timeline has to be pre-planned so that no lecture is missed. Great improvement can be made by restructuring the course-syllabus.

- Inviting experienced and senior professors and experts for visiting IIA on different occasions for taking special lecture series and classes or workshops on different topics. Students can play an active role in arranging such events.
- Exchange Student programs with different institutes can provide more exposure to students in their respective research fields. Making connections with industries for opening multiple career options for students which might attract students from a diverse background with different interests. Having sport-related facilities (like badminton courts) helps to cope with stress & anxieties and helps to recover from mental fatigue.



### Sivarani T.

*Professor, Indian Institute of Astrophysics, Bangalore*

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My interest in physics started during my school days. During my MSc 1st year semester vacation I was fortunate to do a project at IIA Kavalur with Prof. K.K. Ghosh, that was a great experience to see end-to-end taking data and writing the results as paper. Prof. Ghosh is an inspiring person, very friendly and he works really hard. That was motivational. It gave me a fair picture of research and I really wanted to do research. I enjoyed the time at Kavalur, the support astronomers were very friendly and explained about night sky and guiding the telescope. I also liked working with VAX-VMS computers and doing wavelength calibrations. I worked on the spectroscopy of Be-stars and also a little bit on X-ray spectrum of NGC 3783. The results from the X-ray data were published in Astronomy and Astrophysics, it was my first research publication and I am lucky to have this opportunity.

I was shy and did not interact much with astronomers who visited Kavalur, adding to that I had a lot of difficulties in spoken English. Due to the summer project, I wrote the entrance exam for IIA PhD program and joined for PhD in 1992. My family was reluctant for me to pursue PhD, as it would take several years. However, my father always gave full support for higher studies. I took spectroscopic studies of A-F stars with circumstellar disks as my thesis project. Again, I was





really lucky to have Prof. Parthasarathy as my thesis advisor. He is very knowledgeable in the subject and has lots of research ideas to work on. That really inspired me and provided an exposure to a wide variety of topics in astronomy and laid foundation for my later years. I spent most of my PhD time at the observatory in Kavalur doing observations at night and liked to learn about the instruments and try to characterize them during cloudy nights. I learnt a lot from my friends who were PhD students at that time. We spent a lot of time at the computer center, library and tea lounge discussing physics, computing tools and sometimes about cooking. Following PhD, I spent almost 10yrs as a postdoc at various institutions around the

world, University de Montpellier, France, Osservatorio di Trieste Italy, a few months at IUCAA Pune, Michigan State University and University of Florida. I joined IIA as a Reader in 2009. It was a dream come true to return back to IIA. I enjoyed the academic freedom at IIA. After joining IIA, I spent a lot of time in Instrument development at IIA. My first experience was on the development of Hanle Echelle Spectrograph. I thank Prof. Sunetra Giridhar, who was the PI for this opportunity, which helped in my career to pursue astronomical instrumentation. I was also fortunate to have several good PhD students, I enjoyed discussing science with them.



### Smitha Subramanian

*Assistant Professor, Indian Institute of Astrophysics, Bangalore*

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The person responsible for my early interest in Science was my father. Though I lost him at the age of 5, he introduced me to the world of Physics through his collection of books and notes. Science and Mathematics were my favourite subjects in school and I chose to study Physics for my Bachelors course. My mother believed in me and supported me to choose the path of my interest. While doing BSc I received IISc Young Science Fellowship, which provided an opportunity to visit Indian Institute of Science, Bangalore during summer breaks. As part of this fellowship I could attend a series of lectures and do short research projects at IISc. Those projects gave me a flavour of research in science and the stay at IISc, away from home for the first time, helped me to develop a lot of personal skills. For my Masters course in Physics, I joined the Department of Physics, University of Calicut and the faculty members of the department encouraged me to pursue a research career in Physics. I was also introduced to Astrophysics during my MSc.

After my MSc, I got married and my husband was, and continues to be, extremely supportive to chase my dreams. My research career started when I joined the PhD programme at IIA in August 2006. I was awarded PhD in 2012 and after that I was a postdoctoral fellow at IIA in Thirty Meter Telescope project. In 2015, I moved to Kavli Institute for Astronomy and Astrophysics, Beijing as a KIAA fellow for my second post doctoral fellowship. I joined IIA as Assistant Professor in 2018 and I also received the SERB



Ramanujan Fellowship in the same year. My broad area of research is Extragalactic Astronomy and I study the structure and stellar population properties of nearby galaxies to understand the formation and evolution of galaxies. I use multi wavelength data from ground and spaced observatories for my research. IIA has a vibrant scientific environment and provides a lot of freedom to do my research. IIA being part of many upcoming national and international observatory projects, we get a lot of opportunities to contribute to these projects and learn from them. Apart from these activities, I am also involved in teaching. I am thankful to all my teachers, mentors, students, colleagues, friends and family for all their support. My experience as a woman in science so far has been wonderful. Although I have not experienced any discrimination in the work place due to my gender, I am very much aware of the significant gender imbalance in the field of science and the challenges women have to face to stay active in the field. Some of the challenges are to find a job for you and your partner in the same city, to create a right balance between family commitments and responsibilities at work, especially when children are small etc. Though the family commitments are not the responsibilities of the women alone, the social set up in which we live unknowingly builds this

impression in our minds. Things are slowly changing due to the flexible work culture and with men being more open to share family responsibilities. Women need not feel guilty/shy to share family responsibilities and take support when required. Even if it feels uncomfortable, women have to open up while talking about biases in order to remove them. At this point I acknowledge and highly appreciate the conscious and earnest efforts of many staff members of IIA to support their women colleagues and women students. This has created a very friendly environment for women and helped IIA to recruit and produce a relatively large number of women scientists. I hope that IIA will continue these efforts and add more constructive changes such as, provide childcare facilities, mentoring and training programmes for women students etc. Some tips to the aspiring science students are, follow your passion and put sincere efforts to achieve your goals. During your scientific career, be open to explore and learn new things. More importantly, take healthy criticisms in good spirits. There could be many moments of failures and obstacles. But do not give up. The skills you gain along the scientific journey will help you at unexpected times and eventually lead you to build a successful career.



## Sowmya Krishnamurthy

*Postdoctoral Researcher, Max Planck Institute for Solar System Research, Gottingen, Germany*

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My name is Sowmya Krishnamurthy and I work as a postdoctoral fellow at the Max Planck Institute for Solar System Research (MPS) in Germany. My current research focuses on understanding the Sun's brightness variations due to magnetic features on its surface.

I was born and brought up in Bangalore. Despite the financial crunch, my parents sent me and my brother to school and always encouraged us to get good education. Summer vacations after school exams meant visiting our grandmother and nearby villages. One summer evening, I was with my kith and kin on the Shivaganga hill in a village near Tumkur. The Sun had set and the dusk light was slowly fading away. My aunt had begun to narrate stories about Shivaganga hill when suddenly there was a power cut. I raised my head and looked at the sky. For someone who had never seen a sky unpolluted by the Bangalore city lights, what I saw then was alien.

I was astonished by the numerous stars forming constellations, clusters and a few planets that gave the night sky its beauty. Amidst these was a bright little dot moving across the sky which I then called the 'wanderer in the sky'. I was amused by this little wanderer and it was only a few

years later that I learnt that the bright little dot was the international space station. This sight sparked my curiosity to learn how stars are born, how the Universe began, how life on Earth began and so on.. My teachers, who knew about my new found passion for astronomy, guided me to study physics and



mathematics for pre-university, bachelor's and master's degrees.

Prerana vidya poshak, an NGO which financially aided my education, also introduced me to Jawaharlal Nehru Planetarium in Bangalore, where I signed up for the Research Education Advancement Program. Dr. Shylaja, Mr. Madhusudan along with various scientists from the Indian Institute of Astrophysics (IIA), Raman Research Institute and Indian Institute of Science, prepared and exposed many students like me to scientific thinking needed for research. It was through the planetarium that I became aware of IIA and its selection process for Ph.D. aspirants. Thanks to the teachers at the Bangalore university, the little study group that we formed and the year long preparations

with my friends Supriya and Sangeetha to clear entrance exams followed by interviews, in the year 2010, I became eligible to pursue a Ph.D. in theoretical solar physics at IIA. I received the Ph.D. degree six years later. The years spent at IIA and Bhaskara hostel have taught me very valuable life lessons. It has not only helped me to develop as a researcher but also as an individual. Organising and taking part in outreach activities to spark the interest of young minds was one of the best experiences I had at IIA. After graduating from IIA, I spent five months at the Udaipur Solar Observatory learning solar data acquisition and analysis techniques. In June 2017, I joined MPS to carry out post doctoral research in solar physics. I hope to continue doing research with the same curiosity and interest that ignited on the Shivaganga hill.



### Sunetra Giridhar

*Senior Professor, Indian Institute of Astrophysics, Bangalore (Retired)*

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My first exposure to astronomy was through a course on Spherical trigonometry and Astronomy as a part of Maths paper in B.Sc (final). I had some exposure to Astrophysics through popular lectures organized by Late Prof. R.K. Thakur while I was studying for M.Sc. (Physics) at Univ. Teaching Department, Pt Ravishankar Shukla Univ. Raipur. I joined the Indian Institute of Astrophysics (IIA), Bangalore in Jan 1977 as Ph.D Student and submitted my thesis in Oct 1982 to Dept of Physics, Pt Ravishankar Shukla Univ. Raipur where I had registered. More than four decades ago, neither the Indian society nor the most astronomical institutions in India were very encouraging to women joining as students or as faculty. IIA was perhaps the only institution offering equal opportunity to women. Hence it is not surprising that the bulk of early women Ph.D. students came from IIA.

For my Ph.D. work I used the spectroscopic facilities available with 1m telescope at Vainu Bappu Observatory (VBO), Kavalur. The aim was to measure metallicity gradient across the disk of our galaxy using the classical Cepheids as probes due to their well determined distances. I was supervised by late Prof. M.K.V. Bappu till his demise in August 1982 and I submitted my thesis with late Prof. J. C. Bhattacharyya who took a lot of pain to read my thesis drafts and made very valuable suggestions. To calculate the abundance of Fe which I chose as



representative of metallicity, the implementation and use of spectrum synthesis code using detailed model atmospheres for stars on a very basic (single user) computer TDC-316 available at IIA was a very challenging task but it was a quantum leap from the earlier calculations of abundances made using single line approximation of the stellar model. Many IIA colleagues (T. P. Prabhu and A.V. Raveendran) helped in sorting out errors encountered in running the code. This work was highly appreciated and the value of metallicity gradient derived by us was cited in many international journals. I had a long association with VBO along with numerous collaborators (Aruna Goswami, N.K.Rao, D.L.Lambert, A.A.Ferro, S. Muneer) and participated in many interesting research projects such as study of metal-poor stars, Evolved stars like post-AGB stars, H-deficient stars, RV Tauri stars, Pop II Cepheids and variable stars in Globular clusters. This resulted in publication of a large number of papers which attracted a large number of citations. Through DST sponsored projects, I could make visits to the USA and Mexico. We combined the observations from India with those from the USA and Mexico to carry out our projects in a timely manner. We had carried out the luminosity calibration of A, F and G type supergiants using the strength of OI triplet at 7774 Å based mostly on data from 1m telescope of VBO and this work was internationally appreciated. It was a pleasant surprise to be

elected first as Vice President and then President of IAU commission 45 on "Spectral classification" during 2003-06 and 2006-09 respectively. Our collaborative work on post-AGB stars and also RV Tauri stars has been very rewarding. We were the first to detect selective depletion of refractory elements in RV Tauri star IW Car in 1994. This effect was hitherto seen only in some post-AGB stars. We also worked on a compilation of internally consistent sets of oscillator strength of Fe I and Fe II lines, and these papers are also highly cited. I was employed as Research Associate at VBO Kavalur in 1984 and transferred to IIA Bangalore in 1987. I was promoted to research Fellow (1989), Reader (1995), Associate Professor (2001), professor (2007) and senior professor (2014) by the time I retired in 2016 with a 2 year extension of tenure. I was entrusted with many responsibilities at IIA. I served as chairperson of group committee 2 (GC2) on Stellar and Galactic Astronomy during Dec 2002- Aug 2009 which was quite a demanding job since it involved having regular interactive meetings of group members and making group committee recommendations on various policy matters. The GC 2 was also responsible for up-keep of all the telescopes at VBO and their accessories, hence I had to coordinate activities towards the maintenance, repair and replacement of old components and make budget projections. I also served on many committees such as BGS, VTAC, Library, SHCC and Gender Amity

cell etc. I gave several lecture courses for IIA and JAP students and later to Pondicherry University M.Sc. students. I guided two Ph.D. students S.Sumangala Rao and B.A. Sudhakara Reddy and a very large number of summer school students. I led a project on design and development of a high resolution spectrometer giving a resolution of R of 60,000 and 30,000 for the 2m HCT at Indian Astronomical Observatory, Hanle. Getting the funds sanctioned from DST was very challenging. A Detailed Project Report was prepared in 2008 which was reviewed by a national committee of experts from IIA, BARC, IUCAA, TIFR, PRL, ARIES, NCRA and ISRO which strongly recommended the project. Following this the project was funded by SERB/DST under IRHPA scheme with a financial sanction in June 2010. It involved technical collaboration with Callaghan Innovation, New Zealand. The spectrometer design follows a novel concept of white pupil arrangement employed in a large number of modern spectrographs like UVES, HRS etc. It gives a continuous spectral coverage over 350-100nm with minimal light losses resulting in a very high spectral efficiency over a wide spectral

region. A special 4K x 4K CCD with customized AR coating is used to enhance the efficiency in blue and extreme red. The spectrograph was installed and commissioned in Hanle in Sept 2015 and released to users in 2016. The project could not have been carried out successfully in timely manner without the strong supportive team comprising of T. Sivarani (Project Manager), Amit Kumar (Electrical/electronics), S.Sriram (Optics), M.N.Anand (Engineer Electrical/electronics), Anand Maitrey (software Engineer). P.K.Mahesh (Mechanical), S. Kathiravan (Thermal control and instrument transportation). I am indebted to my astronomical colleagues T.P Pbabhu, G.C.Anupama, and P.S.Parihar for wholehearted support to the project. The directors IIA, (Prof S.Hasan and P.Sreekumar) and Scientific advisory team comprising Prof Shyam Tandon, S.K Ghosh, T. P.Prabhu, R. Srinivasan gave many very valuable advice. The spectrograph has been heavily used for many scientific programs including Ph.D. Theses. I am indebted to IIA for nurturing me as a student as well as encouraging and supporting my scientific career.





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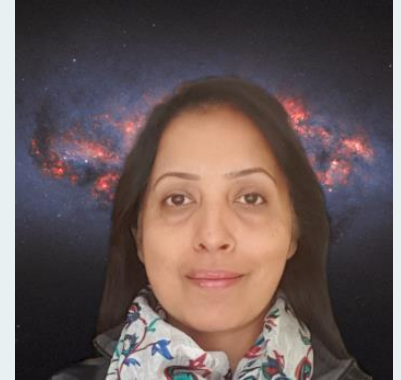
## Swara Ravindranath

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

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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 PhD program in astrophysics at the Indian Institute of Astrophysics in Bangalore. I was among the first batch of PhD research students selected through the selection process held by IIA, independent of the Joint Astronomy Program. My thesis was on Star formation in Starburst Galaxies which was entirely based on observations from the Vainu Bappu Observatory in Kavalur. For my thesis work I primarily used the imaging and spectroscopy observations with the Vainu Bappu Telescope. After receiving my Ph.D from IIA, I did my post-doctoral research work at Carnegie Observatories in California (USA), and then at the Space Telescope Science Institute in Baltimore (USA). I joined the Inter-University Center for Astronomy & Astrophysics in Pune as an Assistant Professor and then became an Associate professor.

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 Investigation Team for the Nancy Grace Roman Space Telescope, and a member of the International Science Definition Team for the Thirty Meter Telescope (TMT).



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

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.



## Vagiswari A.

*Librarian, Indian Institute of Astrophysics, Bangalore (Retired)*

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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



telegrams, a whole range of catalogues, charts, photographic plates, and newsletters. These posed a challenge for us for organising and disseminating the information to scientists. We started circulating a current awareness weekly bulletin to disseminate this information and it was well appreciated by the scientists.

The library shifted from Kodaikanal to Bangalore in 1976, the shifting was a major task, and it was done with great care and as little disruption as possible. This was the second time in the history of the observatory that a whole library was transferred. Earlier in 1900, when Michie Smith was the director; the library was brought from Madras to Kodaikanal on bullock carts and horsebacks. Organising and modernisation of the Bangalore library started soon. Furniture was designed by Dr. Bappu and executed by Michael from Kavalur. The Library improved on the book collection, new journals were added, and other services were introduced. In 1978 a young enthusiastic Ms. Christina joined the library. Soon both of us collaborated in various activities of the library. This was the beginning of a long partnership. The Library also became a part of publishing activity in the institute. The in-house journal Kodaikanal Observatory Bulletins which was started in 1908 and was discontinued for a few years, was revived in 1978 and the library soon took up this

job. Soon most of the publishing activity like the annual reports, brochures became our responsibility.

The bicentennial of the formation of the Madras Observatory to which IIA traces back its origin was commemorated, and an exhibition was held in 1986. The main organisers (NK Rao, Vagishwari, Christina, Kapoor) collected more than 500 exhibits and were displayed elegantly. It was during this exhibition that we realised that IIA had extremely valuable collections of historical documents that needed care and preservation; this laid the foundation of IIA archives. During the 1990s the library started collecting and organising the archival material.

During this time CDAC helped the library to convert some incredibly old books into the CD format. They used the state-of-the-art techniques for this conversion. Consequently the IIA Archives was created with a separate space. IIA was one of the few Institutes with full fledged archives.

In 2008 DST awarded a 3 year project titled important aspects of development of observational astronomy in India (N.K. Rao, A. Vagishwari & Christina). Vigorous data collection was done mostly from Tamilnadu archives in the theosophical society, Chennai and other libraries. Many valuable photographs atlases

and old documents were collected. Our interest in historical research led us to publish several papers in well-established journals. My collaborators were Prof. N.K. Rao and Christina in many of the papers. My first paper with J C Bhattacharyya (1985) on Modern Astronomy in India for INSA was very well received. I also collaborated with A K Saxena on optics in India, a historical survey for DST.

The most important astronomical event of the decade was the total solar eclipse of February 16th, 1980. I was extremely fortunate to be on the organising committee at Hosur, Raichur and witness the spectacular phenomenon.

Co-operation and collaboration among Astronomy libraries for optimum use of the resources led to formation of formal and informal forums. In International level, I was in the two committees one for revision of UDC and the other on producing an Astronomical Thesaurus both sponsored by IAU. I was awarded the Fulbright Fellowship in the year 1988. The fellowship allowed me to work at CALTEC library and PAM library at the University of Texas at Austin. This exposure helped me to think of many new ideas to be introduced in the IIA library.

During my stay in the USA I attended the first (LISA) Library and information services in astronomy held at Washington. I was on the organising committee. The conference offered an opportunity for astronomy librarians all over the world to discuss common problems and possible solutions. This series of conferences were held at regular intervals. I was fortunate to attend LISA2 at ESO Garching, LISA4 at Prague and later I was a special invitee at LISA 6 held at IUCAA Pune.

In connection with the digitization of library documents, the Million Book project of which IIA was a part and setting up of archives requisite research was done on copyright issues for making our database free from any copyright violation. In the 1990s, N K Rao and I were also involved in a documentary on IIA made by the well known director Mani Shankar.

Of the 50 years of IIA I was fortunate to spend almost 40 years. IIA became my second home. I enjoyed working at the Institute. The atmosphere was liberal and congenial for working. There was immense encouragement from all the Directors starting from Dr. Bappu, to Dr. Bhattacharya, Dr. Cowsik and Dr. Hasan. I am proud of the fact that the IIA library is one of the best in the country and follows international standards.



### Vellai Selvi R

*Engineer-D, Indian Institute of Astrophysics, Bangalore*

Let me admit that IIA is like an in-law's house for me as I joined the institute immediately after my marriage. There are two reasons to believe so; firstly, before joining IIA, my husband and I were living at two separate places due to our job requirements. After joining IIA, we started living together at VBO, Kavalur in quarters where I began my motherhood and secondly, since our native place is far away from Kavalur, we used to visit my birth place only once or twice a year while spending most of my time in Kavalur just like any typical married woman. The environment at VBO, Kavalur gives me both happiness and a secure feeling. While working here I was never made conscious of my gender and never had to depart from my work culture. Rather, it is our talent and hardwork that are considered as the important factors to make progress in our career. This developed a strong sense of self-worth in me. As an engineer, my job at VBO is filled with challenges.

I have to constantly think about ways to troubleshoot the problems and issues that come up on a daily basis and work with a male dominated workforce. At VBO, I am given more exposure than what an engineer gets in other companies and offices. I am expected to work independently which allows me to grow and learn new techniques and acquire new skills. I learned that "Passion and hard work always



shine through. All it takes is for us to be a little more assertive and have a lot more self-confidence.”

There are some issues though that could pose some challenges to women employees. For example, initially I was not comfortable at VBO as there are no separate toilets for men and women except at the Canteen. I was not used to this kind of situation. Even at IIA main campus there are separate toilets for men and women. But over the years, I got adjusted to this and I am comfortable now. Initially, it was a little daunting to work with a male dominated workforce. But over the years, after working and sharing work-related topics with men now I realize that it is very similar to working with friends. So now I don't feel isolated or lonely in my workplace. Many of my male colleagues

are very professional in the sense that they respect their female counterparts and always look forward to sharing thoughts. This happens because, here, the importance is given more to the depth of the knowledge and willingness to share/learn and complete the tasks at hand rather than on the gender.

The environment at VBO has taught an important lesson, that is, if we are willing to contribute to the betterment of the organization (in whatever way it may be), we will find people around us who are willing to help us succeed irrespective of our gender. Finally, I urge young women to consider taking up engineering as a profession at observatories as it is filled with challenges and highly rewarding in terms of personal satisfaction.



### Vinod Krishan

*Senior Professor, Indian Institute of Astrophysics, Bangalore (Retired)*

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I became famous as soon as I joined the Indian Institute of Astrophysics. The local newspapers hailed me as the first woman astrophysicist. That was the magic of the IIA. I believed I had a lot of potential and the then director Prof. M. K. Vainu Bappu saw some promise in me. He was known for his vision and farsightedness. The love for nature developed during my early childhood while living with my grandparents in a small town in Punjab called Nurmahal. The landscape of fields and ponds extended to the stars when suddenly one night it rained stones. The various myths faded away when, much later, I was initiated into the spectacle of meteorite showers! I recall, in school, one of my teachers discussed in the class the difference between a scientist's and a poet's sighting of the moon. At that time I felt that it would be right to combine the two views. This thought continued to stay with me and became validated when I came upon the ode by John Keats "Beauty is truth, truth beauty".

So here I was at the IIA in the Koramangla campus which was still in the making. Being one of the first few faculty, I participated in almost every aspect of the upcoming institute. I remember Prof. Bappu asked me to procure the appropriate equipment for the yet to start canteen. I along with a colleague and the then purchase officer spent most of the day shopping for the right kind of plates, glasses and other sundry items. We returned to the IIA late in the evening to find Prof. Bappu ready to report to the police the missing first woman






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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 !





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the Indian Institute of Astrophysics, Bengaluru.

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Editors

Aruna Goswami

Maheswar Gopinathan

Ravinder Kumar Banyal