

PROFESSOR GOVIND SWARUP'S CONTRIBUTIONS TO INDIAN SCIENCE: THE RECOLLECTIONS OF A NON-RADIO ASTRONOMER

Arnab Rai Choudhuri

*Department of Physics, Indian Institute of Science,
Bangalore 560 012, Karnataka, India.
E-mail: arnab@iisc.ernet.in*

Abstract: Professor Govind Swarup FRS, the doyen of Indian astrophysics, passed away on 7 August 2020 at 9 pm. In this short tribute to 'The Father of Indian Radio Astronomy', I want to write about him from a personal perspective, primarily in a non-radio astronomical context.

Keywords: Professor Govind Swarup FRS, Indian Science, Joint Astronomy Program, Indian Institutes of Science Education and Research

1 INTRODUCTION

Accounts of how Professor Govind Swarup (1929–2020; [Figure 1](#)) established and developed a thriving school of radio astronomy in India have already been published by various authors (e.g. see [Orchiston and Phakatkar, 2019](#); [Srinivasan, 2015](#)). In this short tribute I want to write about my close association with Govind Swarup, which was mainly in a non-radio astronomical context. An account of somebody's scientific achievements often does not always make it clear how the next generation will view them. Perhaps my personal account will bring out other aspects of Swarup's character and make readers who had not known Swarup intimately realize why he holds such a place of affection in the hearts of many of us. I am 27 years younger than Govind Swarup. Within the general field of astrophysics, our research specializations were as different as one could imagine. While Swarup was an extragalactic radio astronomer, I am a theoretical solar physicist, and our research styles also were totally different. After some very brief comments on Swarup's scientific achievements, I shall discuss how an unlikely personal bond developed between the two of us.

2 GOVIND SWARUP'S RETURN TO INDIA, AND THE DEVELOPMENT OF INDIAN RADIO ASTRONOMY

Around 1960, when Govind Swarup was a budding Assistant Professor at Stanford University, four young Indian radio astronomers working in the USA sent a joint letter to the heads of several Indian organizations stating that they were willing to return to India and build a radio astronomy group if any place offered jobs to all of them. Only one head of an organization could give a positive reply to such an unusual request: Homi Bhabha, who had established the Tata Institute of Fundamental Research (TIFR) a few years earlier, but there

was no astrophysicists at TIFR at that time.

Bhabha decided to offer jobs to these four youngsters. Of the four, Govind Swarup was the only one to stay on at the TIFR. Others tested the waters and then returned to their greener pastures, presumably because they felt that the conditions in India would not enable them to do competitive research at an international standard in radio astronomy. But Govind would not give up. He went on to build two of the world's finest and most innovative radio telescopes—the Ooty Radio Telescope in the late 1960s, and the Giant Metrewave Radio Telescope (GMRT) near Pune in the early 1990s—completely indigenously, with the help of engineering skills available in India.

He showed that India was capable of building world-class state-of-the-art radio telescopes. I was quite close to him when he was planning GMRT and he excitedly told me a lot



Figure 1: Professor Govind Swarup FRS (courtesy: Tata Institute of Fundamental Research).

about it, although I understand nothing about telescopes. I remember that there was widespread skepticism about it in India at that time. Many pundits declared that India did not have the technological know-how to pull off such a complex project and it would end up in a failure.

Additionally, Govind had a very limited budget, a fraction of what everybody thought it would cost to build such an ambitious radio telescope of such a size. All the time, Govind had to continuously think of ingenious ways of cutting down the cost. After the noted British astrophysicist Professor Roger Blandford heard of the total cost of the GMRT he used to refer to it as ‘The Great Indian Rupee Trick’.

The other challenge for Govind was that he needed to hire good engineers for the project. He told me that at the time when the Ooty Radio Telescope (ORT) was being built the salary of an engineer in a private company was about 1.3 times of what he could offer in a Government organization, and by the time of the GMRT this ratio had become >2 . When building the ORT, Govind managed to get a lot of engineering support from several talented PhD students, some of whom had undergraduate engineering degrees ([S. Ananthkrishnan, pers. comm., December 2020](#)). However, the GMRT was a more complex project and a few engineers had to be appointed to work on it. Obviously, some gifted young engineers agreed to work with Govind at this hugely reduced pay only because of his charisma and personality, and their chance to get involved personally in forefront science and technology.

3 GOVIND SWARUP'S CONTRIBUTION TO INDIAN SCIENCE: A PERSONAL PERSPECTIVE

The contributions that Govind Swarup made to Indian science (note that I write “Indian science” and not “Indian astrophysics” or “Indian radio astronomy”) are so vast that future generations will surely marvel that such a person even existed.

Apart from TIFR, the second Indian organization with which Govind Swarup had a very close link was my workplace, the Indian Institute of Science (IISc). He spent several years on the IISc campus in the 1980s when the TIFR radio astronomy group was housed in a building not far from the present-day Physics Department. It was at this time that he took the initiative (with Professor V. Radhakrishnan of Raman Research Institute and Professor Vainu Bappu of Indian Institute of Astrophysics) of establishing India’s first graduate school

in astrophysics: the Joint Astronomy Programme (JAP). When Chanda Jog and I joined the IISc in the late 1980s, we received tremendous support and encouragement from Govind. A disproportionately large number of today’s senior and middle-aged Indian astrophysicists (much more than 50%) were trained through the JAP.

Before writing a little bit about this Programme and how my association with Govind began, let me make a few remarks about the second mission of Govind’s life besides building radio telescopes. He always said that, if good Indian scientists only did their research in their isolated ivory towers, then Indian science had no future. We have to attract bright young students to basic science and then train them properly. It was in this second mission of his life that Govind interacted with me perhaps more closely than with any other Indian astrophysicist.

Before the JAP was started, there was no place in India that offered academic courses in astrophysics. Consequently, any Indian student wanting to do a PhD in astrophysics had to learn the subject on his/her own. As graduate programmes in astrophysics became the norm around the world, Govind felt that India also must start her graduate programme. The model he came up with was that students would be taught by astrophysics faculty members of different institutes and, after coursework, these students could work with any faculty member in a participating institute. Since the IISc had an atmosphere closer to a university than other institutes with astrophysics groups, Govind wanted the IISc to be the nodal point of the JAP, although there were no astrophysicists at the IISc at that time.

When I joined the IISc at the age of 30, I found quite a lot of work for the JAP dumped on my shoulders. I do not know what Govind saw in me, but he almost gave me a blank check to implement anything in the JAP that I considered appropriate—from restructuring the course curriculum to formalizing inter-institutional arrangements. In many meetings to discuss the JAP, Govind would come to my rescue when I would be attacked from all the sides, and made sure that I would get my way. I am not suggesting that what Govind used to do was the best way for a senior person to manage such a complex situation. But it shows what kind of person Govind was and, in this process, I developed a strong bonding with him. I used to spend a lot of time in the building of the TIFR Radio Astronomy group, especially in their cozy library. I felt like an orphan when the group shifted base to Pune to

build the GMRT!

Govind was very worried in the 1990s that many of the famous Indian universities had declined (he always fondly recalled how he had been taught by giants of Indian physics like K.S. Krishnan when he was an MSc student at Allahabad University). Govind felt concerned that young Indian students did not have too many choices in those days for a good undergraduate training in basic science. He (along with Professor V.G. Bhide of Pune University) presented a detailed proposal to the Government of India that it should start institutes of science exactly like the IITs. At first there was considerable progress with the proposal, but then it got shelved. A few years later, the idea was revived and the Indian Institutes of Science Education and Research (IISERs) were established following the model given in the Swarup-Bhide proposal. They, therefore, should be regarded as the ‘spiritual fathers’ of the IISERs. I know that Govind used to feel a little hurt that he was not given enough credit for this, because this was a project that was very close to his heart. Currently there are seven different IISERs spread throughout India (see Figure 2).

I was closely associated with Govind for what he once described to me as the biggest failure of his career. He had a soft spot for the state of West Bengal in the eastern part of India (from which I come), and in the 1990s was very concerned that, even though some of the best physics students were coming from that State, there was no centre of astrophysics there (this was before the astrophysics group started at the Indian Institute of Technology in Kharagpur). He was very eager that an astrophysics centre should be set up in the campus of a university there, and Professor Chanchal Majumdar was one person who was giving him strong support from the Kolkata side. (Kolkata is the capital of West Bengal).

Although I was about 40 at that time and with no standing in the Indian academic community, Govind sent me as his emissary to hold meetings with Vice-Chancellors and senior professors of Jadavpur and Visva Bharati universities. There was quite a lot of enthusiasm and Govind also managed to raise initial funds to start such a centre. After coming very close to being realized, this project shamefully got derailed due to the political intrigues of some Bengali academics (I do not want to describe this matter in detail), who suspected that Govind must have had some hidden ulterior motive! It was unbelievable to them that somebody could selflessly devote so much time to a project without any self-interest. Govind

told me ruefully that it was the only time in his career that he had to abandon a project after it came so close to realization.

When I was in Kolkata with Govind for a 2-day meeting to discuss this centre, the second day was declared a bandh (general strike) by the Left Front at very short notice. So we had to squeeze the whole meeting into one day. Since it was not possible those days to change flight bookings at such short notice, Govind had to spend the second day in the SN Bose Centre guest house. As I knew that Govind had come to Kolkata solely for the sake of Kolkata, I did not want him to be left alone on a day of bandh. I asked the SN Bose Centre to also give me a room in their guest house. When Govind came to hear of this, he protest-



Figure 2: A map showing the current location of Indian Institutes of Science Education and Research (map: Wayne Orchiston).

ed repeatedly: “You have your parents and in-laws in Kolkata. You should go and spend time with them. Why do you want to waste a day with an old man? I shall be fine. Do not worry about me.” But he obviously felt relieved that I decided to stay with him. Luckily, the cooks at the guest house showed up and we had good food. Since there was nothing else to do in that day of bandh, Govind talked to me for several hours, about his childhood and youth, the dreams he had as a young man, his deep patriotism, his concerns about common people of India, his achievements, and the difficulties that he had faced in his career. That day remains etched in my memory as one of the most memorable days of my life.

I now describe a rather personally humbling encounter that I had with Govind Swarup

in Thiruvanthapuram about 3-4 years ago. T. Padmanabhan and I had been invited to give two prestigious invited lectures on astrophysics at the National Space Science Symposium held at the Vikram Sarabhai Space Centre. On arriving at the guest house, I found Govind there. He told me that he had come to give a regular talk in a regular session. I felt really awkward that, while I was giving a prestigious invited talk, such a legend of Indian science had come to give only an ordinary talk. Govind sensed my discomfort and seemed to be quite amused by it. He gave his disarming and almost child-like smile and said:

You will surely describe the many important results that have come out of your research group in the last few years. But I have not come here to talk about my past achievements. I told the organizers that I wanted to give a regular talk on the new research I have started a year ago. I am very excited about it and want to tell others. The organizers wanted to fix an invited talk but I did not agree, because that would not be correct. I have not done anything important in this new field yet.

Here was a man close to 90 did not want any special arrangements. He had come from Pune alone, ate the regular food at the guest house with us and walked to the conference venue (about half a kilometre from the guest house). Apart from giving his talk on radio observations of Venus in a session where all the other speakers were less than half his age, he listened to the other talks attentively to find out what younger people were doing.

I end this short paper by mentioning one other incident. Once when I was at the GMRT site (probably about 15 years ago), a British journalist had come to see GMRT on that very

hot summer day. Although Govind was then in his mid-70s, he was showing the visitor around. When we were walking towards the cafeteria for lunch, Govind saw that the journalist's car was parked under the shade of a tree at the farthest corner of the parking lot. Without telling anybody anything, he suddenly sprinted 50 metres in the scorching Sun and told the driver "aap thoda khana ke liye idhar aiye" (i.e. "Please come and join us for lunch"). That was Govind Swarup. When he was head of a group or a project, there would be no 'hierarchy' of any kind. He would regularly sit down for lunch or tea with the junior-most engineer or the youngest PhD student. Everybody who worked with him felt that they had to give their best for him.

4 CONCLUDING REMARKS

Those of us who had the opportunity of being close to this gem of a human being will always remember him for his passion for science, for his deep humanism, for his compassion for fellow human beings and for his towering intellect. There has not been another person like him in Indian astrophysics and probably never will be.

5 ACKNOWLEDGEMENTS

I originally prepared this account for private circulation among friends upon hearing of Swarup's death, and had no plan of publishing it in an academic journal. I am grateful, therefore, to Professor Wayne Orchiston for urging me to publish it. I wish to thank Dr Anantha-krishnan (Centre for Radioastrophysics, Pune, India) for commenting on the MS, the Tata Institute of Fundamental Research for kindly supplying Figure 1, and Professor Orchiston for preparing Figure 2.

6 REFERENCES

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Arnab Rai Choudhuri obtained his PhD from the University of Chicago in 1985. After a 2-year postdoctoral stint at the High Altitude Observatory, Boulder, USA, he took up a faculty position at the Indian Institute of Science (IISc), where he has remained since that time. During his tenure at the IISc, he had held visiting positions at University of St. Andrews, Kiepenheuer-Institut für Sonnenphysik Freiburg, Montana State University, Max-Planck Institut Lindau, Cambridge University, National Astronomical Observatory of China and National Astronomical Observatories of Japan.



Choudhuri's main research interest is to study magnetohydrodynamic (MHD) processes in astrophysical systems, especially the Sun. He is one of the originators of the flux transport dynamo model, the currently favoured theoretical model of the 11-year sunspot cycle. His textbooks—*The Physics of Fluids and Plasmas* (1998, Cambridge University Press) and *Astrophysics for Physicists* (2010, Cambridge University Press)—are used in many universities around the world. He is also the author of the popular science book, *Nature's Third Cycle: A Story of Sunspots* (2015, Oxford University Press). Choudhuri has been a recipient of the Alexander von Humboldt Fellowship and the JC Bose National Fellowship. He is an elected Fellow of all the three science academies of India as well as The World Academy of Sciences (TWAS).