

What's Happening

In The Sky?

"Astronomy is not an abstract subject. It is one of the most aesthetic subjects one can encounter. You think in terms of large integrals of time, distance, mass..." S. KUMAR talks to Dr. M. K. Vainu Bappu, director of the Indian Institute of Astrophysics, Bangalore.



Dr. M. K. Vainu Bappu, director of the Indian Institute of Astrophysics, Bangalore and current president of the International Astronomical Union.

S. KUMAR: India had a great tradition in astronomy through persons like Aryabhata and Bhaskaracharya. Has this tradition been nurtured through the ages? Does it not look as if this culture of astronomy is decaying?

Vainu Bappu: I do not believe one can call it a decay of astronomical culture because there is hardly any decay. If one looks at the history of contributions in astronomy which have originated from this country, particularly in recent times, it will be clear that they are on a par with several efforts of similar kind made in different countries.

If you were to start with, say the 18th century when Jaisinch built several observatories, those were probably of that time, the best that existed anywhere. Then, under the British influence there had been more developmental activities in astronomy in India than perhaps in any other branch of science. Because, the British introduction of sciences into this country, as conceived in the West, was essentially something which first of all started with astronomy, primarily for the requirements of salacious navigation. Formation of the Madras observatory in 1792 was the first scientific effort in this connection and this observatory is today continuing in Bangalore as the Indian Institute of Astrophysics. In the 19th century, Madras observatory had facilities comparable to many good observatories anywhere and several important discoveries emanated from there. The highlights of contributions made by the Madras observatory in the period 1860 to 1900 include the discovery of hydrogen emission in the solar prominences during the famous eclipse of 1868 at Guntur, the discovery of helium, the discovery of several variable stars and asteroids, to mention a few. Thus, the output of Madras observatory was not inferior to that of

any other place but the resource problem was obviously being felt around 1875-80. Then, there was a miniature technological explosion elsewhere in the world and the large-sized telescope was ushered in while the Madras observatory continued with its 18-inch telescope.

Around the turn of the century, the observatories committee at London, with Lord Kelvin as its chairman, decided to adopt newer lines of research and hence, a new location from where the research could be efficiently pursued. Thus, the Kodaikanal observatory was established. Within the first few years of its existence, with very good facilities for the observation of the sun, a very major discovery was made at Kodaikanal -- the discovery of emission effect.

There have also been some quality contributions in astronomy which formed the foundation of astrophysics and they originated from Indian minds. The formulation of ionisation formula by Megnath Saha is the basic foundation of astrophysics. Any aspect of astrophysics would encounter the Saha formula which deals with the distribu-

n of atoms in different states ionisation and excitation. The stars were earlier being classified on the basis of their colour but the Saha formula, for example, enabled the classification of stars according to their temperature, thus turning astrophysics into a quantitative subject from a qualitative subject. From the 1930s to the early '60s, the very principal name in theoretical physics was that of S. Chandrasekhar (nephew of Sir C. V. Raman). His contribution to our understanding of the phenomenon of radiation transfer in an atmosphere and in the understanding of several aspects of stellar dynamics and ionised plasma, were significant milestones in the history of science. Therefore, I would say that consistent with the available resources contributions from the Indian soil were substantial and

is not as if we had a distinguished past and a dull recent past.

SK: Seen in the light of your assessment, it is strange that Indian universities do not teach astronomy in a systematic way. Barring a couple of them, no university in the country has a department of astronomy. What prevented astronomy from percolating to all academic institutions?

VB: Astronomy is universally recognised as a subject in the frontiers of knowledge. Most of the major discoveries pertaining to our understanding of the physical phenomena are connected with astronomical measurements. I agree that many universities in this country do not teach astronomy in a systematic way. But I visualise the effective teaching of astronomy as

essentially something which comes within the scope of present day physics. For the study of physics and properties of matter, we have a vast laboratory provided by Nature in the cosmos which has diverse characteristics like high temperatures, low temperatures, high pressures, low pressures, vacuum and density, which are not normally found in an ordinary laboratory. I am not sure whether it is absolutely essential to have an exclusive course for or an exclusive effort to teaching astronomy. Take the case of the United Kingdom which produces so many astronomers. I think hardly two or three universities in the UK offer exclusive courses in astronomy. It does, by no means, belittle the significance of astronomy in everyday education. For example, Oxford has good observatory, Cambridge has one. It is part of the institute of astronomy where, essentially students work for their doctoral degrees though it offered undergraduate teaching. The same system is available in India and the Indian Institute of Astrophysics is an example.

SK: How does an amateur astronomer differ from the professional and what is his role?

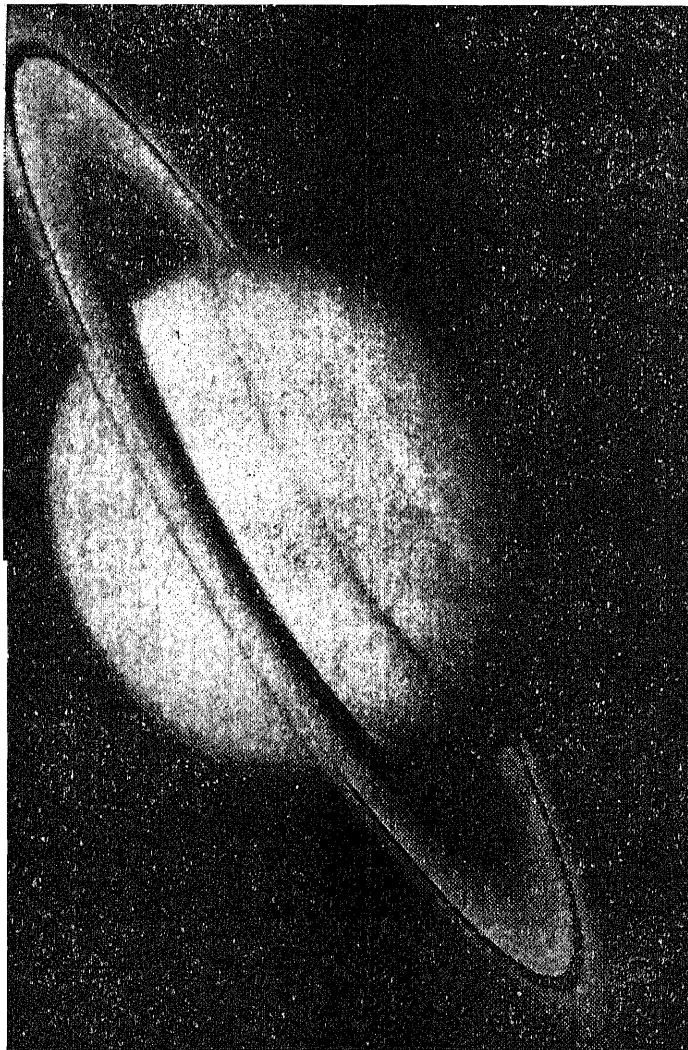
VB: Love of the subject is the sole criterion to classify an amateur. A professional uses astronomy for his livelihood. In the 18th and 19th centuries, amateurs played an important role in all sciences. Several earthshaking discoveries in astronomy were made by amateurs in the last two decades. Study of meteors, sunspots and solar flares were all the results of amateurs' activity and astronomy depended on them for progress.

Systematic search for comets is a striking contribution of amateurs. L. C. Peltier of the US, author of *Starlit Nights*, who died in 1980, never went through the high school, but he discovered 12 comets, the first at the age of 18 and the last at 60. Minoru Honda of Japan too has

12 comets to his credit. He is now interested in detecting the novae. Honda has been driving several miles away every night and systematically exposed a string of eight cameras for a

couple of hours, returned home, developed the rolls, slept for a while and woke up to find a nova in the exposures.

But, even some patients suffering from insomnia have



This photo was assembled from Voyager II Saturn images from a distance of 13 million miles.

found some odd configurations of stars and discovered novae but there was an element of fluke. But, Honda has been continuing his exercise for the last four years systematically. Many professionals may miss many features by sleeping over it. That amateurs still have a say in the matter shows how sleepy the professional is. The Japanese have discovered many comets in recent years. Statistics indicate that once in 400 hours one should come about a comet after a systematic search. It is unfortunate that not a single comet has been discovered on the Indian soil after a French priest discovered a comet from Pondicherry in 1682. (Dr. Bappu himself discovered a comet in 1949 in America which has been named after him as is the custom. The comet is visible once in 60,000 years).

Amateurs have a fertile field in the discovery of comets and in studying the cometary spectroscopy. Since, astronomy is becoming increasingly sophisticated, I mean it is getting beyond the resources of any one individual, it is likely that amateur's role will be on the decline. But I think the amateur's principal role is going to be spreading of the cult by his constant effort at keeping the flame of enthusiasm alive because ultimately when we triumph it is not going to be in the instruments and resources but in the fact that the human mind is capable of doing what it has done and therefore, the biggest resource of everything is the fact that there are human minds to pursue these problems.

SK: While the west is going in for telescopes of 200-inch size and the space telescope is in the offing, what are we going to do with our less sophisticated and redundant instruments?

VB: Your question implies that current work in India is not sophisticated but it is not so. All of us around the world look at the same objects in the sky, be it the sun, stars or planets. Therefore, there is an element of competition. There is no redundancy in information supplied.

Of course, we have some resource constraints. Efforts are being made to improve the resources consistent with the means of expenditure at our disposal. We are now constructing a 90-inch telescope at Kavalur and when commissioned by the end of next year it will be the biggest telescope of the country. There will be only 15 telescopes larger than the Kavalur telescope in the world. Since, telescopes are got to be made, it is ridiculous to siphon off crores of rupees to another nation for making a telescope. We have to make them. We have to acquire and develop the technology ourselves. The 90-inch telescope is a very good step before taking the next larger step. The world is not waiting for us. But unless we take these steps we will never reach that stage.

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There are similar efforts in other areas of astronomy. We have some of the largest radio telescopes in the world. There is one at Ootacamund, which has four times the collecting area of the Jodrell Bank, in the UK. Newspapers always quote Jodrell Bank whenever occasion arises, not realising that there is something larger than that in our own backyard. A radio telescope, 60 miles north of Bangalore, has a collection area of about 13,000 sq. m. There are only two or three radio telescopes in the world with comparable collection area. In 1977, there was a little bit of excitement over the rings around Uranus. A major share in the discovery of the Uranus rings originated from Bangalore.

SK: Astronomy is being equated with abstract mathematics. How will one change it

into a subject of aesthetic interest?

VB: Astronomy is not an abstract subject. It is one of the most aesthetic subjects one can encounter. There is a grandeur and a homogeneity of different patterns. You think in terms of large integrals of time, distance, mass etc. Those who are impressed by astronomy are principally impressed by the fact that they have this large, marvellous, staggering variety to think of. It is a reality.

SK: What do you think of the recently discovered "big void in the universe" and a black hole in Centaurus?

VB: One has read about them in newspapers. I had not had a chance to see them in scientific publications, perhaps it is too early. Therefore, I really cannot make any comment. I would, for instance, like to know how the black holes were evaluated. Perhaps, the excitement has to be explained in terms of some big energy supplying device and since one could not find it, it is ascribed to a black hole. Anything we can't explain is now called a black hole. It is only an interpretation. Let us wait and see.

SK: What is your opinion on the correlation between the sunspots and weather?

VB: About 100 years ago, a study was made in India. Sunspots and rainfall were correlated in Madras but sunspots and draught were not correlated in Calcutta. It looked a little queer. But, undoubtedly the variation from the sun which changes over the solar cycle does have some effect on the overall global weather pattern.

SK: What according to you were some of the significant discoveries made in 1981?

VB: The occultation of Uranus and the fact that the ring systems show a variable aspect. The Voyager studies on Saturn and the double quasars. There were no unexpected, startling discoveries. For instance, in 1977, Uranus rings were really talked about. But, finer structures in Saturn's rings are not totally unexpected.