

standards of scholarship which he demanded from the younger generation of scientists who joined him. Perhaps the environment in which such all-round development could have taken place had not progressed to that desired level to give effect to the lofty ideals which Raman

held. Let us hope that many of us who have gained from his inspiring leadership and association with him will live to see his noble ideals kept alive and the high aspirations which he had held out for the Institute, achieved.

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## RAMAN AND ASTRONOMY

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**M**ANY a great man-of science, whose personal contributions have led to the unravelling of some of Nature's secrets, has been an ardent admirer of Nature's handiwork and its beauty. Raman belonged to this restricted fold, whose members gained inspiration from the beauty of their surroundings. The blue of the ocean, the plumage of birds, floral colours and the symmetry of crystals gave him a feeling of intense rapture, and the inspiration to ponder over their origins and characteristics. Likewise, the canopy of stars as seen on a clear moonless night must have stirred the imagination of one who was so much impressed by natural splendour. Indeed, in one of his writings he has described astronomy as "a heaven-born river of knowledge which flows to the earth and fertilizes the fields of learning and culture".

For one who had such an intense feeling towards the splendours of the science of astronomy, Raman's personal involvement in its development has been only from the side lines. One may consider this surprising. An explanation would be the limitation imposed on an individual's selection of a sphere of effort, by the brevity of the human life-span. Raman has often said that should he be given the opportunity of living his life all over again, he would choose to be an astronomer. This statement is expressive of his interest and the fascination that the subject had for him.

As one whose principal researches lay in the science of optics, Raman admired the contributions of the large aperture telescope to astronomical progress. He believed that "progress in astronomical science in a country depends on the existence in it of skilled opticians who can grind, polish and figure great lenses and mirrors up to the most exacting requirements". These words appraise the situation with as much correctness today, as

they did three decades ago when he expressed them. A great admirer of John Brashear, the famous American telescope builder, he felt that the immense support which American men of wealth gave astronomy in their country, was to a large extent the offshoot of Brashear's telescope building capabilities and his love of the stars. Like the connoisseur of art, he delighted in the sheer artistry and precision of a well-figured mirror. He was happy to possess a few of the mirrors made by one of his contemporaries, H. P. Waran. And he derived the satisfaction of a dream-come-true as it were, when he learnt that Jayarajan at Kodaikanal had been successful in figuring larger mirrors for astronomical use, and that we had embarked on a large scale telescope-building programme.

Raman was a Visiting Professor at the California Institute of Technology in Pasadena, for a few months in 1924. These were stirring times in astronomical history and must have left a lasting impression in his mind. The Hale era at Mount Wilson was at its peak where the great 100-inch telescope had just gone into operation, and in the hands of Hubble had almost as a first result yielded the spectacular transformation of our concepts of distances in the Universe. Raman recounted these momentous days often; the sights of the gaseous nebulosities that he viewed through the 100-inch had etched in his memory a picture of inspiration and beauty. Years later, I had an account of his first visit to Mount Wilson from J. A. Anderson of diffraction grating fame, who had given Raman his guided tour. Raman spent a couple of nights on the mountain taking in the heavenly sights at night and exploring the mountain side during the daytime. Anderson also recalled how Raman took his companions by surprise, walking barefoot over the various trails on the mountain, in preference to the foot-gear his

comrades of the enterprise considered necessary.

Raman had been very vociferous in his plea for strengthening research effort in astronomy in this country. Writing in *Current Science* in 1943, he considered that "the organization of scientific research in India must be considered radically defective unless and until adequate provision is made for astronomical study and research of the highest grade in the country". This stems from the conviction that the universe is a vast physical laboratory providing an infinite variety of experience. The results of observational astronomy have really been the nucleus of current physical thought and the interaction between physics and astronomy has been to mutual advantage. In our age of space consciousness, astronomy has regained

its importance in providing the framework of scientific culture and associated technology that is meaningful to human welfare and progress. In a country with a rich cultural heritage of the past, and where the desire to seek a meaningful future through the methods of science prevails, science planners would do well to pay heed to Raman's words on the need of an invigorating climate of observational astronomy. Recent developments in the country, in the form of support to the astronomical cause, augur well for the future. Poised as we are on such a threshold, let us hope that the contributions of the Indian astronomical community will, in the years to come, be such as to bear out Raman's convictions on the role of astronomy in his country's welfare.

## PROFESSOR RAMAN'S INTEREST IN METEOROLOGY

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I DID not have the good fortune to be a student of Sir C. V. Raman. Although I had met him and talked with him a few times in 1947, 1951 and 1961, I came in fairly close contact with him only in 1964 when he asked me to organise a symposium on Meteorology at the Annual Meeting of the Indian Academy of Sciences at Poona in December 1964 and made me preside over the symposium. At that symposium, he asked several questions regarding the cause of "jet streams" in the atmosphere. He thought that the jet stream was an important global phenomenon of which there ought to be a simple explanation.

I came in closer contact with him since December 1965, after I had retired from service and settled down in Bangalore, when he nominated me to be a member of the Council of the Indian Academy of Sciences in a vacancy that had just then occurred. In the five years prior to his passing away, we met a number of times when he discussed with me problems of meteorology, specially those concerning the general circulation of the atmosphere and jet streams, sometimes for an hour or two at a stretch. He did me the honour of visiting me at my residence several times for borrowing books on meteorology or for discussing meteorological problems engaging his attention. I believe he appreciated expression of frank and forthright views by me on some of

his views on jet streams and the general circulation of the atmosphere.

He spoke on Weather and Atmospheric circulation at the Raman Research Institute as Gandhi Memorial Lecture on 2nd October 1967, and published an article on "Zonal Winds and Jet Streams in the Atmosphere" in the issue of *Current Science*, dated 20th November 1967. He also spoke before the Aeronautical Society of India, Bangalore Branch, on the same subject. It was also the theme of his Presidential Address at the Annual Session of the Indian Academy of Sciences at Madras on 19th December 1967. A summary of this address appeared as an article in the *Current Science*, dated 20th March 1968.

Sir Raman's main thesis was that the jet streams are phenomena directly connected with the rotation of the earth and but for the rotation of the earth, they would not exist. He explained this in a simple manner as in his article in *Current Science* of 20th March 1968, and said that "a clear understanding of the manner in which the rotation of the globe influences its gaseous envelope is of the utmost importance in the present context". I had occasion to mention to him that the effect of the rotation of the earth on atmospheric circulation had been realised and studied since the times of Hadley and Helmholtz and that Rossby and Defant's "mixing theory" of jet