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ASTRONEWS

New Mars from Pathfinder

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Another milestone was reached in the history of space exploration on 6th June 1997 when Mars Pathfinder successfully landed on the Martian soil. Cocooned in a giant airbag, Mars Pathfinder bounced a number of times on the Martian surface, rolled on the treacherous Martian Ares Vallis and then came to a rest just thirty km away from the pre-selected site. The airbag deflated and the lander and the rover came in direct contact with the Martian atmosphere. The tiny rover successfully landed on the Martian surface and imprinted its wheelmarks on the Martian dust creating another landmark.

There were three main scientific instruments on the Pathfinder Mission to study the Martian surface in detail. The lander was equipped with a stereo-camera to take pictures of the Martian surface and a weather package to study the details of temperature, wind velocity and pressure variations etc. The rover Sojourner carried an instrument called Alpha Proton X-ray Spectrometer (APXS) to study the composition of the Martian soil and rocks.

The scientific data and pictures started to beam to the Earth from the first day of landing and continue till todate. The Ares Vallis was choosen for the landing site, as it was believed to be located at the mouth of a catastrophic outflow channel which flooded the Martian surface in some remote past. It was expected to be rich in variations in the surface composition which could tell something about the Martian history. The first few pictures taken by the lander's camera confirmed this assumption. It showed that the Martian landscape was filled with a variety of rocks. There were twin peaks just a few km away from the lander and a crater rim was also clearly discernible in the pictures. The pictures revealed that the whole area was a flood land, even a layman could instantly recognise that something had flown (most probably water) in a particular direction around the landing site. This impression was further supported by the fact that many boulders in the neighbourhood were round in shape, probably a result of the splashes of the flow. Rocks and other features have been named as Barnacal-Bill, Yogi and Scooby Doo etc. The rover Sojourner started making measurements of interesting objects from the third day after landing. It moves to an object of its interest with the help of a laser ranging guidance system, places APXS on the object and carries out the measurements. The APXS impinges alpha particles on the object, receives the reflected alpha particles and protons and

measures their spectrum from which the relative abundances of the elements can be determined. The first such object examined was the Martian soil scooped up by the rover's wheels. The result is that the composition of the soil is not very much different from that of the Earth's. An examination of the rock Barnacle-Bill showed that silicate is highly abundant (58%). This was rather unexpected and difficult to explain. The Sojourner is taking measurements of different rocks and other topographical features. Their analysis can bring out a few more surprises. One of the intriguing features of some of the big rocks (such as Yogi) is that its two faces have different colours. Scientists believe that this may be due to the weathering process, one face of the rock being exposed to the flow of air from a particular direction. Another interesting revelation is that the Martian dust particles are magnetized. This may shed some light on the question whether the Martian magnetism is intrinsic to the planet or produced by the solar wind interaction.

The weather package has shown that the temperature varies in the range approximately –79°C to –9°C; the maximum temperature is reached sometime after the Martian noon. Wind speed direction changes during the course of the day, the maximum wind velocity being a few miles per hour during the day and about 10 miles per hour during the night. The average pressure was 6.9 millibar during the first two days. This can be compared to the average sea-level pressure on Earth of 1013 millibars!

The deceleration measurements during the entry phase of the lander when compared with that of the Viking lander measurements, showed that Martian atmosphere has changed by a considerable amount during the past twenty years. This information and the current weather measurements will help scientists to plan for the future Mars missions such as Mars Global Surveyor. In summary, Mars Pathfinder mission is a highly successful one. It has already added a lot of new information about Mars and a lot will surely be revealed from the data it had already sent and yet to send. Success of this mission will surely give impetus for future Mars exploration. The age old query whether life existed on Mars or not, has to wait for future missions as the current one was not planned to answer it.

Based on the information collected from Nasa Webpage. Details can be obtained from http://mpfwww.jpl.nasa.gov.

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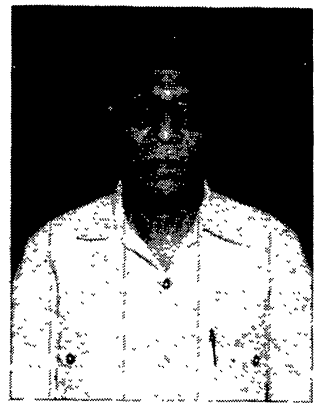
Silver Jubilee Article



Research, my passion

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In 1969, Prof. R.S.Verma, the then Head of the Department of Mathematics, University of Delhi, called me to his office and asked me, why I was not doing research. I had no valid reason for that except that I never thought of it. On his persuasion, I did my Ph.D. on a topic in Celestial Mechanics from the University of Delhi in 1970 at the age of 42. Earlier, I was totally dedicated to the teaching of Mathematics. And, now, research has become a compulsion of my mind. It gives me solace when I am depressed or find myself in a hopeless situation. It gives me joy which I cannot describe. The quality of my happiness has increased manifold with the passage of time.

During my student days, I had developed special interest in Mechanics and Astronomy and so my supervisor Prof. R.S. Verma suggested me to choose some topics in Celestial Mechanics but at the same time told me very frankly that he was an expert in the subject. There was hardly any book available on Celestial Mechanics either in my institution, Zakir Husain College (formerly Delhi College) or in the main library of the Delhi University. There were very few people in India who knew about the subject. Inspite of my serious and sincere efforts, I failed to make any progress. And then my supervisor asked me to contact Prof. R.K. Choudhary who had recently returned from Moscow after obtaining his Ph.D. in Celestial Mechanics. On contacting him, he readily agreed to help me provided I came to Bhagalpur. On the appointed day and time I reached his residence in Bhagalpur, but to my surprise and disappointment, he had left for Samastipur a day earlier and left a message for me that I should meet him there. I went to Samastipur, but again I was told that he had left for his village and had asked me to wait for his return to Samastipur. At last after a torturous wait for four days, I could meet Prof. Choudhary in Samastipur. His extremely affectionate behaviour immediately put me at ease. We went to Bhagalpur together. I was given four problems relating to 'Periodic orbit with a collision in restricted problem of three and four bodies'. Hardly had I solved one problem, I was summoned by my principal to Delhi and so reluctantly I had to cut short my visit. I stayed at Bhagalpur only for twenty one days. After returning to Delhi. I was lucky to solve the remaining four problems in one month's time. Initial frustration amply rewarded me in the everlasting friendship with Prof. Choudhary.