Cultivating the right scientific temper

Scientific outlook depends on factual evidence and statements that can be checked against established truth. Progress can be achieved only when such outlook prevails over innate conservatism.

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WHAT is scientific temper? Why is its relevance being felt *now* rather than in the past? Is it an individual trait or does it also extend to societies, cultures, civilisations? To what extent is it prevalent today? What can be done to make it more widespread?

Today we live in a free country which is feeling its way towards economic prosperity. Yet we are still a long way away from achieving that scientific outlook so essential for our future well-being. To appreciate what the scientific outlook is all about, let us first see how science itself works.

There are three steps in the progressive march of science: experiment and observations, theoretical interpretation and prediction of new results. One performs experiments in the laboratory, or observes some natural phenomenon and then tries to interpret it in terms of a theoretical framework. There is always a possibility that a future experiment may disagree with the predictions of the theory, in which case it may have to be abandoned or modified or replaced by a new and better theoretical framework. The scientific outlook has evolved from this practice of science: it relies on factual evidence and statements that can be checked against established truth. It allows pragmatism, that is willingness to drop a paradigm if it fails the test of facts and to adopt a better one if it meets all factual checks.

Science and superstitions

Superstitions are born out of ignorance of how nature functions. Science is dedicated to the unravelling of the mysteries of nature. As one particular mystery is solved, we should expect the superstitions based on it to disappear. Yet, this does not always happen in practice because of the lack of scientific outlook in the typical human being. When I am asked this question: "Do planets affect human destiny?" I wonder whether these people are unaware of the scientific advances that have long debunked beliefs of this kind.

The early human societies ascribed occult powers to planets. This assumption arose from ignorance of what planets are and how they move. Now that astronomy has answered all of the questions raised about planets by the primitive man, we should expect this assumption to be regarded as groundless. Yet this has not happened. Even in the technologically advanced countries this belief persists among sections of educated classes. In the mid-1970s a group of leading scientists including several Nobel Laureates in the West signed a circular denouncing the very basis of this belief. I give below an extract from their statement:

It is simply a mistake to imagine that the forces exerted by stars and planets at the moment of birth can in any way shape our futures. We must all face the world, and we must realize that our futures lie in ourselves, and not in the stars... (The Humanist, Sept./Oct. 1975).

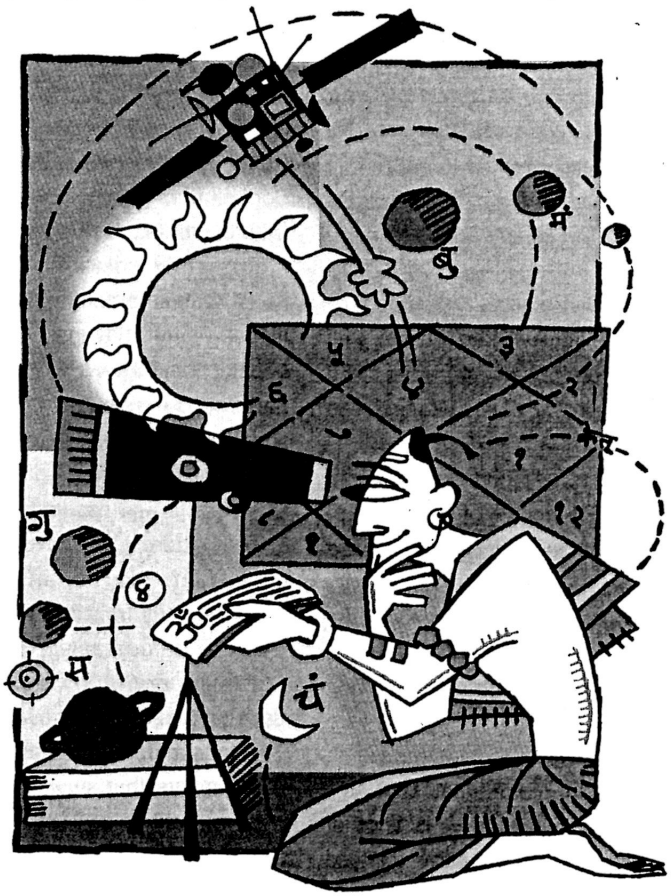
Do planets influence human destiny? How will a scientist go about testing the hypothesis? He will not be satisfied by the prediction by a single person based on a single horoscope. First he will require a set of well-defined rules on which such predictions are based. The rules should be unambiguous so that different persons make the same prediction from the same horoscope. Next he will need to be convinced that these rules work in a statistically significant manner to discount the possibility of the prediction being right purely by chance. This will require a systematic study of a large number of such trials under different conditions.

It is then necessary to cast the prediction in a well-focused form where it can be tested. Such tests as conducted so far by scientists have yielded negative results. But again, it is not always necessary to call upon a professional scientist to perform such tests. The educated common man can himself sift the evidence provided he adopts an objective outlook.

We have several NGOs devoting their efforts to spreading rationalism and to eradicating superstitions. There are organisations which conduct public awareness programmes through lecture demonstrations, street plays, experiments debunking the so-called miracles, articles and books on the importance of the scientific temper, and so on.

While there are several such laudable efforts in an organised manner both in and out of the government, what is the mindset of the 'person in the street'? Can we confidently assert that in the half century since independence, we have made a significant dent in the wall of superstitions?

Superstition is not confined to villages only. The episode of the idols of Lord Ganesha drinking milk drew large crowds in Delhi, Mumbai and other cities in India with some ministers also expressing their wonder and joy at the sight. It did not take long to debunk the phenomenon in terms of known science, but perhaps of greater concern is the rising trend towards superstitions. Several symptoms can be cited of this trend.



1. More marriages are being arranged today by the criterion of matching of horoscopes than a generation ago. Thus I know of parents whose marriages were not passed through the 'horoscope filter', but whose children feel it necessary to apply this criterion to their marriage.
2. With new technology, new superstitions are getting hold of the society. A recent rage is Vastushastra and its Chinese counterpart, the Feng Shui. None of the claims of these subjects have passed scientific scrutiny.
3. Despite debunking of Godmen's miracles by science, a large section even of the educated urbanites continue to believe in the *Babas* who demonstrate their superhuman powers through miracles. In fact this is an area where science journalism could bring its investigative aspects to bear. So far it has registered moderate success but much more needs to be done.

The legitimisation of astrology as a 'science' by the University Grants Commission is another symptom of this unfortunate trend. The UGC used the word 'Vedic Astrology' implying that the subject is of Vedic origin. All historical evidence, however, shows that planetary astrology using horoscopes came from the west, from Greece, Babylon etc. And so on, and so forth!

We have only to look at the remarkable progress of science over the last few decades to see that a properly channelled scientific approach holds out hope for the future. The achievements of space technology in our country, the rapid growth of communications which has dramatically brought the far corners near, the advances in medicine, biology, agriculture – are they not scientific miracles happening before our own eyes and achieved during less than the span of a generation? Unlike the so-called miracles of the so-called godmen, the miracles of science benefit not one single individual, but a whole class of humanity.

The developed nations have recognised these facts and they not only support science in general but also continue to encourage basic research. For us to ignore basic research at this stage would mean that we will have to keep on importing new ideas from abroad. This would be contrary to our policy of self-reliance. India has plenty of talent for basic research, most of which is untapped. Suitable support for basic research will unearth this talent and bring in its own rewards in the long term if not immediately.

When Lord Krishna finished narrating the Gita to Arjuna, he ended by saying: "Reflect over what I have said, fully and then do what you wish." In a sense this is what the scientific temper calls upon us to do: to weigh in all the evidence and then decide what is best. I am confident that if, and only if, we are not blinded by traditions and dazzled by science but keep our visors open and our minds alert, our country will make a triumphant march towards progress in this century.