

SCIENTIFIC TEMPER

A couple of years ago, the whole country witnessed an amazing spectacle. Statues of Ganesha all over the country and reportedly even overseas were drinking milk! Hundreds of thousands of people supposedly saw the phenomenon and would swear by it. Some commentators waxed eloquent on the inherently “superstitious” nature of our people, while others saw a conspiracy on the part of the revivalist Hindutva forces. In the midst of all this, there was an extremely interesting incident which did not get the attention it deserved. On the television, a simple cobbler was interviewed and far from being impressed with this modern day miracle, he calmly demonstrated how his iron anvil could also “drink” milk! . Interestingly, the cobbler sits outside the National Physical Laboratory (NPL) , the country’s premiere scientific institution. On the other hand, the acting director of the very same NPL was reported in some newspapers as explaining the phenomenon in some spurious and longwinded way, complete with high flautin jargon. This unwitting juxtaposition of the two: an academically respectable scientist and an uneducated cobbler creates a remarkable image which is in many ways representative of the way we as a society perceive science.

We find nothing unusual in the harmonious coexistence of education, superstition and other pseudo-scientific mumbo jumbo. There are any number of incidents in which highly educated and respected scientists have displayed surprising unscientific attitudes. For instance, during the 1980 solar eclipse, one of the most respected scientists in the top most research institution in Mumbai insisted on having a ritual bath and purifying everything in his house. This same person, professionally would hold forth on some of the most esoteric scientific theories! Does this constitute a lack of scientific temper or is it merely a bifurcation of professional and personal belief systems? The whole issue of science and scientific temper in a society, especially one as diverse as ours has to be explored in some detail before we can pronounce judgments.

In 1976, Article 51-A was added to our constitution with the infamous 42 Amendment. One of the fundamental duties of the Indian citizen, the article instructs is “ To develop the scientific temper, humanism and spirit of inquiry and reform in our citizens”. This is an extraordinary statement and begs several questions. For one, note that it talks of **the** scientific temper to be inculcated in our citizenry. This of course presupposes that there is a well known definition of scientific temper that one has which needs to be propagated amongst the populace.

Before we talk of scientific temper, it is obvious that one needs to understand what we mean by science. Scientists have rarely stopped to ask what is it that characterizes what they do. They have just gone and done it. Of course, one could define science as something which scientists do! On the other hand, philosophers have spent an enormous time trying to define science and how it fits into other creative endeavors of human beings like religion. These two different perspectives exist because scientists are more concerned about the particular

systems that they investigate which may be a bacteria or a galaxy, while philosophers have been worried about the scientific process as a whole.

Straitjacketing the definition of science to a particular body of theory is immensely restrictive. It is far more fruitful to define it as a methodological prescription as Robin Dunbar has done it. He defines science as a method of finding out about the world based on a generation of hypothesis and testing the predictions based on the hypothesis. While this definition has been used by a variety of philosophers and social anthropologists to argue that this approach to science is unique to modern Western culture. But, as Dunbar shows convincingly in his book, "The Trouble with Science", the methods of empirical science are far more universal. For instance, the Fulani pastoralists of Mauritania have a well-developed system of looking for water. Much like trained hydrologists, they use a variety of indicators to look for underground water. These include local topography, locating particular plant species and the presence of certain animals like amphibious lizards. Or the agro-pastoralist Shona of Zimbabwe who use a very detailed and sophisticated method of deciding when and where to plant their crops. Most of the claims of these pre-literate societies have been tested and indeed have a sound "scientific" basis. One could think of many such examples from societies all over the world including our own country where traditional systems of knowledge on wide ranging subjects like health and water harvesting have a sound basis in science. This is not to say that one needs to uncritically accept the traditional belief systems *in toto*, but only to broaden our definition of science to include parts of traditional knowledge which have been tested experimentally.

The point then is to look at science as a much broader human endeavor (though Dunbar claims it is characteristic of all higher forms of life including primates) than just something which is codified in the textbooks. Once one accepts this as a working definition of science, then it is not at all clear whether one can unambiguously define scientific temper. Ordinarily, one associates scientific temper with literacy and a knowledge of science. But then how does one explain the completely unscientific behavior of the scientist in Mumbai? This dichotomy is a hallmark of many educated people including scientists. One could argue that how one conducts oneself in her/his personal life is of no concern to us here, but then that is neither here nor there. One needs to understand why otherwise rational, highly educated people for instance will still wait for Rahu Kalam to pass before doing anything significant. It is indeed refreshing to hear the Railways Minister, Mr. Ram Bilas Paswan, holding forth in the Parliament on the failure of India to develop scientifically. He chose to apportion the blame on "our faith in luck and God". He pointed out that even our engineers and architects put black painted pitchers on new buildings to ward off the evil eye.

Not that this is a problem peculiar to us. Several surveys have conclusively shown that a majority of the population in the United States believes in horoscopes and astrology. Clearly, education does not necessarily imply scientific temper. The case of the erstwhile Soviet Union is even more instructive. There is an enormous growth in the antiscientific attitudes amongst the people of CIS. Whether it is astrology or levitation by meditation, Soviet society is witnessing a definite change in the attitude of the people.

A society which was for seven decades self consciously trying to shape a rational and scientific human being is today deluged with mysticism, faith healing and other such mumbo-jumbo. Huge audiences listen in rapt attention as gurus and seers hold forth on the supernatural and mystical. ESP, UFOs, clairvoyance and such are no longer taboo subjects of discussion. Superstition is on the rise and faith healers are attracting many patients.

What are the causes of such a turnaround in public feelings? Why is it that a society where scientists and academics were accorded the highest social status (in fact even higher than most Party functionaries), is reverting back to medievalism? Sergei Kapitza, a leading physicist of the CIS, suggests that the answer lies in the social crisis facing the country at the moment. Quoting examples from European history, he argues that whenever there is social unrest and frustration, there is an almost certain increase in the belief in the irrational. For example, in the 7th century, there was a decline in the authority of the church and the emergence of science (this was the time of Copernicus, Bacon, Descartes) alongwith the emergence of capitalism. During this cataclysmic period, superstition and mysticism flourished in Europe, as evidenced for example by the burning of thousands of so called witches. What the erstwhile Soviet society is witnessing today is in a certain sense no less momentous than the changes in the 17th century. The older regime has crumbled and the economy is in shambles. There is a collapse of authority and centrifugal tendencies have led to the demolition of the Union itself. Unfortunately, though the *ancien* regime has collapsed, alternative structures have yet to emerge. The stranglehold of the Party on Soviet life has only been replaced by complete anarchy and a free for all. And sadly, the current events don't allow any optimism on this score either.

The examples of the United States and the CIS countries among others clearly indicates that just by literacy and education, it is not necessary that one could build a rational being. But in our society, it is clear that literacy is neither a necessary (as indicated by the example of the cobbler) nor a sufficient condition for developing a scientific temper. It is much better to tentatively define scientific temper as an attitude of critical questioning and testing of given knowledge in practice. Whether it is the Sai Baba conjuring Seiko watches or Ganesh drinking milk, it is important to question the received knowledge and test it. Development of a critical temperament is the key function of education, though not necessarily solely determined by it.

Unfortunately, our educational system does not encourage either of these two traits. Students are encouraged to digest the knowledge given to them uncritically and not question their teacher. This is not only true in a vast majority of schools across the country run by the State, but also in the so called elite schools. This way of thinking gets frozen and is further enhanced in our university system which encourages rote learning and superficial knowledge. Apart from this, the whole idea of testing some hypothesis in practice is alien to our educational ethos. Using ones hands is looked down upon, and it is not uncommon to come across students who have finished school without performing a single experiment! The net result of this is a literate population which excels in reproducing what has been taught without really internalizing it or seeing its rel-

evance in the real world. The connections of what one learns in the classroom and one's life is never made.

Of course, for the vast majority of our citizens, going to a school remains a luxury. Given their precarious and uncertain existence, it is understandable that they could be vulnerable to superstition about events that they cannot understand leave alone control. Nevertheless, it is remarkable that the uneducated have a very good sense of experimentation and improvisation. To see this, all we need to do is to visit the neighborhood car mechanic. He probably does not understand the complexities of the mechanism in your car but has through experience and testing perfected the art of repairing it. This tinkering is a hallmark of our craftsmen and artisans and workers. In the olden days, if your car broke down in a remote hamlet, the tractor mechanic would somehow get the car moving even without proper equipment and spare parts. To my mind, this is hypothesis testing in the real world and certainly constitutes a scientific temper.

So here we have an interesting reversal of roles. The educated citizens who should be more scientifically inclined have chosen to just use the benefits of education for getting ahead in life. Education has indeed broadened their outlook but by and large whatever they have learnt has not been internalized into their day to day life. The sole purpose of education has been reduced to securing employment. And interestingly, a growing fraction of these people are aiming to be "fixers" in the non-competitive, crony capitalist aberration that our country is. On the other hand, the genuine fixers, the plumbers, the car mechanics and the pump set repairing farmer, remain at the bottom of the pyramid. For them, words like scientific temper and science have no relevance. They just lead their lives, learn the lessons of life by experience, work hard, and at times are fascinated by Ganesh drinking milk. All this while their more "enlightened" and educated brethren(including the venerable Secretary, Dept. Of Science and Technology) go into raptures over charlatans like Ramar Pillai and his herbal petrol.