

their impact on higher education. Increasing the number of colleges alone cannot help to improve the quality of science education. Science subjects and industry-oriented programmes must be updated from time to time. But most of the universities have old syllabi with minor modifications and if they feel that the subject is outdated, they introduce new IT (information technology) subjects instead of science subjects. This attitude must be shunned and latest science subjects must be introduced according to the requirement of the new era. Personal conflicts should not be reflected in the syllabi.

Nowadays we are producing a large number of IT graduates, rather than science graduates. Though this is good in some respects, mushrooming growth will produce a large number of unemployed graduates, rather than IT professionals. Most of the technical discoveries have been made by scientists. Hence the opportunities for studying science in technical education should be increased. Universities and other educational institutions must accept the responsibility of bringing out new syllabi, which will meet the global requirement.

Science should be popularized in two ways. One, by introducing value-based and industry-oriented programmes. Two, by government support in the form of funds and sanction of more science projects. Hence both government and private educational charitable trusts must take necessary action to bring about a revolution in science education.

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Mad cow disease – A timely warning

Amidst all the hype and furore over the UGC and Vedic astrology controversy, a grave and important warning given by Jacob John from the Kerala State Institute of Virology and Infectious Diseases (*Curr. Sci.*, 2001, **80**, 1090) on the possibility of bovine spongiform encephalopathy (BSE), or mad cow disease-infected cattle having already entered India, needs to be noted. Ignoring this would be at our own peril. Given the extent of apathy among our scientific community on important issues like this (didn't we all sleep blissfully while UGC was already getting its circular ready), we will most likely prevaricate until a few million cattle die here or a few thousand humans contract the variant form of the rogue protein-induced disease called vCJD (variant

Creutzfeldt Jacob disease). On the other hand, almost every issue of *Nature* or *Science* has an article on the spectre of BSE stalking continental Europe. Countries that 'had judged themselves BSE-free have been shocked out of their complacency' (*Nature*, 2001, **409**, 658–659). The same article goes on to warn public that, 'No one knows whether the diagnostic tests being used to search for BSE infection in Europe's cattle can reliably detect animals incubating the disease'. I was rather amused by a more recent issue of *Nature* discussing the resolution passed at the 1 January 2001 meeting of the European Commission as a package of measures to combat BSE. (i) Complete ban on the use of mammalian meat and bone meal for all livestock. (ii) Removal

of bovine intestine from food chain. To the poor farmer in India, using mammalian meat to feed his herbivorous cattle would be an act of 'sacrilege', an 'unthinkable distortion of the mind'. Let scientists, administrators of science and policy makers remember this the next time we go overboard on accepting everything coming from the 'Western world', be it GM food, golden rice or the mandatory CFC certificate for refrigerators and freezers.

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The Vedic astrology controversy

I have no particular position in this controversy nor is it necessary. What you believe is really your own prerogative. Does it hurt others? That is the question.

The debate has the ridiculous and the sublime sides, which require equal attention.

The ridiculous: Everybody knows why UGC started this. We are not talking about rational approaches, but of platforms (of government) and of mindsets (of ourselves) in all these. 'Indian vs foreign' evokes many chords, some sympathetic and some antagonistic, in all

of us. What was suggested by some was a class action. St George raises again to slay the dragon of irrationality. Where is the damsel in distress?

1. Does it hurt science? No. It should be explicitly recognized that science has no

meaning outside the professional context. It is hardly a few hundred years old in the West as an organized activity and far less in India. It is decided by those who practice it (a strange case of the inmates deciding the entrants to the asylum). It has no monopoly on rational thought, though its practitioners tend to be carried away.

Having a few drugs that work, does not make Ayurveda a science. When someone tested Ayurveda, they really did not test the theory behind it. Unless you have a way to 'map' the foundations of Ayurveda into rigorous modern science (which is not possible as of now) you cannot test it, regardless of the number of successful remedies.

2. Does it hurt society? Any act, however good or indifferent are the intentions, can lead to misuse. Such worries are wholesome. Why do schools of Ayurveda produce students on grounds of indigenous systems of medicine and ancient wisdom, while many of these students practice allopathy, for which they are not trained?

3. Does it hurt students? No. I presume that there will be at least some takers of such courses and 'free' will shall prevail. It will be instructive to know if there is a market for these students. If there is, why not? Biotechnology had much less than what was claimed, at least to start with!

4. Does it hurt the love for the subject? If eight million die on the same day due to an atom bomb, as an argument against horoscopes, as many students taking up computer sciences also cannot be due to personal choice! It is simply a matter of market forces.

5. Does it hurt the teachers and teaching? No. Much damage has already been done to education. This sense of futility explains how various teachers' associations have been primarily concerned with jobs and arrears.

Another question, a little too late, is: do universities care? Very few do. Personal experience and research have never been a criterion in the recent past in uni-

versity education. We have national labs and elite institutions separately for it.

The sublime: It is not the original sin, but a time-worn confusion prevalent over several decades as to what constitutes science. Broadly speaking, three stances are offensive: (i) The arrogance of physics-centricity of science. (ii) Science is the exclusive and valid model of rationality. (iii) Testability and falsifiability as the hallmark of good science. Some comments have been heated largely due to what were seen as ill-placed arguments.

When a crisis, real or perceived, is faced, it is time for the faithful to re-examine their souls. When an argument like astrology as a science is posed to us, good or bad, we examine first what science is all about. Then we ask whether we are going about it in the right way. The issues that need examination relate to the philosophy and method of science. Then only, the sociology of science!

If what is scientific relates to its derivability from first principles, then would the monsoon prediction with the now well-known sixteen parameter model be scientific? Good science, at its most primeval level as well as at its most complex levels, remains ill-defined and conjectural. There have been many attempts to prove or disprove astrology. What is being tested, the predictions or the theory? Without that distinction, would application of, say, principal component analysis, help ratify the science and non-science of palmistry or astrology? Those who have information on these may well begin to share the technicalities.

'What is science?' is a risky topic, since science is an operational definition of an activity of a group or groups of people. Feyerabend made a point that to be rational, you have to devote equal time to science of voodoo and witchcraft. Even Feyerabend did not visualize these as sciences, but as internally consistent world-views, with their own intrinsic coherence and rationality. If science is an exclusive definition of rationality, we should have supported Nazi views on

cleansing the populations and pure genetic breeding based on 'the then' science. I thought that history had taught us a very dear lesson that human rationality embodies humanism, which transcends the mere confines of science!

The problem is not whether Vedic astrology is a science or not. The problem is in the absence of the perception where science really matters, i.e. at the cutting edge where ideas are being formed, science did and will break every single rule that the professional scientists preach and yet will not lose sight of conformity as its long-term goal. This science makes big mistakes, hasty conjectures, ill-founded remarks, and many other sins. Niels Bohr was moved to remark that elegance is strictly sartorial, since it is merely an afterthought! This science, rash and breathtaking as it is, does not require government pronouncements nor 'elite' institutional support. This science supports them instead! This science and its practitioners are not and will not be threatened by Vedic astrology or any other.

Lastly, Mahalanobis proposed in the late 1930s that Indian Science Congress should establish a separate section for statistics. This request was dismissed on the excellent grounds that (*sic*) if a section on statistics is to be established, they might as well establish one on astrology! Mahalanobis then organized a parallel special conference in statistics in 1938 presided over by Fisher himself. By 1950s, the Indian Science Congress established a section on statistics!

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Editors' note: The final form of this letter was received just after closure of correspondence on this subject in the 25 July 2001 issue. This is truly the last letter.