

Scientific temper and education: virtues of science in the early 20th century India

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Science is not possible in the absence of epistemic values (truth, simplicity), but what are the moral conditions (good, right) that secure these epistemic values in a just prosperous society? The question of value of science is not separate from the question of values in science-education. In the study of science and values, we have to ask two complementary questions: what are the values that science is expected to bring to education, and what are the values that an educated person is expected to bring to the theory and practice of science.

‘Our young geniuses are passionately ambitious instead of being passionately passionate; and it has become very difficult to distinguish between what is an ardent search for truth and what is a vigorous promotion campaign. What started as an adventure of the highest has become the survival of the slickest or the quickest. ‘Cloak and dagger’ has changed to ‘cloak and suit’. We now have DNA tycoons and others have ‘made a killing’ in RNA... the feeling to be a pioneer at no extra cost... A generation of scientific quiz kids knowing the answer to everything... a time in which everything that is new is true ... the general sloganification of science... great names can substitute for great concepts ... Mix anything with everything in the right proportions and the resulting puree will say: Papa!’¹.

King Rajavahama smiled. ‘Behold!’ he said ‘adultery aided by trickery has become a legitimate means to ensure and enhance both virtue and fortune. In your hands it could cause your parents to be freed from evils of captivity, help destroy a wicked enemy, and restore a monarchy all at the same time! Is there any means that is not justified by the intelligence of the person who uses it?’².

We value what contributes to our well-being. Science is a human achievement. Science is of value for its potential (and actual) contribution to human well-being: to human happiness and flourishing. Of course, a potential contributor to human happiness could also be a potential contributor to human misery. Value is double-edged, and this is precisely the reason why education is central to human

lives. Science is virtuous, but only in the acts and intentions of the educated. The question of value of science is therefore not separate from the question of values in science education. In the study of science and values, we have to ask two complementary questions: what are the values that science is expected to bring to education, and what are the values that an educated person is expected to bring to the theory and practice of science.

Generally, the talk of value of science is limited to its pragmatic and epistemic aspects. We often ask if science is useful or harmful, or if it tells the truth about the world that we experience. But, the talk of values in education is not limited to pragmatic and epistemic values; it has to include ethical (and aesthetic) values as well. For education aims to achieve the student’s epistemic as well as ethical well-being: in education, one is not possible in the absence of the other. And it is evident that the pioneers of science in India understood this. They did not see science in isolation from its material, epistemic and ethical dimensions. Here we revisit some of their writings to reflect on the question of values in science: to what idea of science they sought commitment of the people of India? And thereby, what demands the learning of science is expected to put on the learner (qua person) and on society that the learner is part of?

Some of the early 20th century scientists in India asked if their society in general was found wanting in the practice of moral and intellectual uprightness necessary for its just-material flourishing. They despised prevalent mystification and idle speculation. M. N. Saha (1893–1956; physics) notes: ‘Nothing could be farther from the truth... [than] an impossible Utopia where everybody

lived in peace and harmony, undisturbed by famine and pestilence’³.

In P. C. Ray’s (1861–1944; Chemistry) reflections: ignorance of human obligation results in blind pride that is antithetical to the development of science and society. He asks: are we ‘willing to regard the advancement of philosophy... more than [the advancement of our] own reputation’. Every human being is capable of reflection and reason. Every human being has received the God’s ‘gift of wisdom’. It is therefore obligatory for each of us ‘to think... for ourselves’⁴. And, to accordingly regulate the public deliberation. Ray senses pompousness in the slogans such as ‘national awakening’, when a ‘wide variety of weird popular customs... cripples’ the nation. For Ray: ‘Blind patriotism is a serious block in the way of truth... The truth at the core of things will remain hidden from us forever, we shall never be able to discover it, if our judgement is overpowered by prejudice, if we fail to raise above indolence’⁴.

Awakening is possible when education – including science education – educates both human conscience and human judgement in the service of truth. Note that both the conscience (morality) and judgement (rationality) have to constitute the scientific temper. Ray rightly asks:

‘[O]nce conscience and judgement are pulled from the throne they have occupied in the kingdom of human ideas, and sent into exile, does it not amount to the banishment of humanitarianism, the noblest treasure of mankind? Once blind pride comes to occupy the seat at the top, does it not fling the greatest glory to the dust?’⁴.

S. N. Bose bemoaned the poetic justice that, in his view, characterized the general

attitude and outlook of his fellow countrymen. The rampant twisting of facts in words and behaviour: 'This is what strikes me often – the way we have with words, and it's same with our behaviour, and our attitude to science'. Could we hope that science education will teach us the discipline of mind that 'enables one to call a spade a spade'? Or, with implicit abuse of facts and repetitive renderings of dogmas are we lost on the possibility to possess clear and courageous eye of the child?

'When a child comes into this world, he knows nothing of it. And yet he finds joy in everything... The child-like attitude is lost... we find instead a calculating, commercial intelligence prevailing and a lot more; filling... [the minds] so much that even truth becomes warped and falsely perceived'⁵.

Bose is categorical about his love for the country and its intellectual traditions. But, in his view, 'if this love leads us to distort the factual truth at every step, then this love has no value'⁵. One of the measures of truth is coherence or consistency in our individual and social beliefs and actions. Contradictions have no place in society where truth is a measure of progress. Human progress runs on 'resolving the contradictions' in human life – in human experience and knowledge (I am using here the words of S. N. Hasan)⁶.

The question then is: what intellectual climate, what social, political and economic set up, what moral and ethical concepts, and what religious outlook support the growth of science in a society? Just as society cannot develop without the development of science, science too cannot grow in vacuum – 'divorced from social objectives and the moral compulsions evolved by society'. Y. Nayudamma⁷ argues that in the west, science fought a public battle with orthodox values and attitudes, while in India it grew under the Government patronage and hence never had to openly challenge prevalent 'intellectual attitudes and values'. He contends that science in India 'developed as a mere academic discipline'. Due to the policies of the Government of Independent India, the number of science institutes and scientists increased, 'but it did not generate a scientific movement'. Those who took to the

study of science had a 'peculiar ambivalence – of being scientist in the laboratory and addicts of anti-scientific attitudes, believing in ritualism, social prejudice and other common beliefs at home'⁷.

According to S. N. Bose, the people of India may believe that science has changed the 'external features of our civilization', but 'the scientist has lost the right philosophical outlook' (about the soul of man, about god). Well, if science has failed to educate us, then so does our philosophy: have we learnt to live without desire, anger and delusion? A 'philosopher' may charm us by telling that this world is nothing but an illusion. But, Bose asks, is 'the poverty and ignorance that prevails' also an illusion (*maya*)?⁵

'[If a] high premium [is set] on the sleepless contemplation of the eternal verities... recognize[ing] the world as a temporary halting place... [T]he individual [then] thinks of his own salvation as the principal aim in life... creating a carelessness in all mundane matters... the neglect of a serious acceptance of life by our first-class thinkers brought secondary petty people into prominence who gave lip-adoration to philosophy but actually engaged in jealousy, squabble and internal strife.' (ref. 5, pp. 176–177).

Along with establishing their own work in sciences, Indian scientists had to establish and institutionalize the culture of science in India, least by founding the institutes of research and teaching in science and technology. But that is not all, they also had to work on the potential contributions of science to the material and personal well-being of everyone, while addressing the nationwide problems of diseases, famine, and blind-dogmatic-misplaced faith in the supernatural. They saw that science and science education is an essential element to save the masses from depravity. In the view of these thinkers, the temper of science should set the tempo of education and development; social and material well-being has to rest on intellectual and moral well-being. In the absence of the latter, the former is considerably senseless even if it were to be possible. This scores a larger educational point: rational well-being is a precondition to moral well-being and

rational-material well-being presupposes moral well-being – and science education has to bear out this presupposition.

Why must moral well-being go hand-in-hand with the rational and material well-being? Because, first, the material growth in moral-rational vacuum could never be *just*. Early and mid-20th century scientists in India were committed to the flourishing of the *whole* society (indeed of the whole humanity). It was evident to them that, if large chunks of the society were to remain irrational, this rampant irrationality and ignorance may breed moral corruption, in turn leading to unjust growth. Second, they must have thought that only the proper education in science will help Indians learn about the natural causes, and to master already powerful mechanical modes of harnessing nature to good human ends. In the face of abject poverty and ill-health, only mechanical modes of control could yield enough quantities to fulfil basic human necessities of the time. Here our focus was on the first aspect: on science education for moral-rational-material well-being.

Science is not a mere means-end reasoning. To do science is to be a person of science – it requires the characteristic epistemic abilities and corresponding ethical courage and commitment. This scientific temper was not unknown to the early 20th century science in India. We did see an attempt to resurrect the same outlook again in 1980s, when a public statement on scientific temper saw that the virtuous vision with which science and its education was to be instituted in India is already failing: 'the modern tools of propagation and communication... being used to give the impression that there exist instant and magical solutions for the problem that confront *our* people... periods of history [being] interpreted to inculcate chauvinism... [and] fan communalism, oversimplification of the struggle of people for freedom, and so forth'⁸.

Science is not possible in the absence of epistemic values, but what are the moral conditions that secure these epistemic values in a just prosperous society? Unless educationists reflect on the values inherent in science, science education will not be able to secure the grounds for the *authority* of science. The question of values is central to science education if the science student is expected to develop scientific understanding of the

natural world with the characteristic moral and epistemic authority⁹. Science education is bound to remain a poor contributor to the moral fabric of society, if science educators choose to remain oblivious to the relationship that obtains between the character of scientific knowledge – of how this knowledge is secured, and of a scientist as a pursuer of scientific knowledge.

1. Chargaff, E., *Essays on Nucleic Acids*, Elsevier, 1963, pp. 176–177; 183; 185.
2. Buitenen, J. A. B., *Tales of Ancient India*, The University of Chicago Press, Chicago, USA, 1959, p. 217.

3. Saha, M. N., In *The Scientist in Society*, Thema, Kolkata, 2010, pp. 93–96, 107–144, 148–154.
4. Ray, P. C., In *The Scientist in Society*, Thema, Kolkata, 2010, pp. 25–35.
5. Bose, S. N., In *The Scientist in Society*, Thema, Kolkata, 2010, pp. 159–180.
6. Hasan, S., In *Science Society and Scientific Attitude*, Bangalore University, India, 1977, pp. 1–11.
7. Nayudamma, Y., In *Science, Society and Scientific Attitude*, Bangalore University, 1977, pp. 58–74.
8. A statement on scientific temper. *Mainstream*, 1981, 6–10.
9. Bardapurkar, A., In *Proceedings of episteme 7 – International Conference to Review Research on Science, Technology*

and Mathematics Education (eds Ladage, S. and Narvekar, S.), Cinnamon Teal, Mumbai, 2018, pp. 9–16.

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Errata

Diverse behaviour of C-3 enolates derived from configurationally isomeric trimethyl 1-methylcyclohexane-1,2,3-tricarboxylates

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[*Curr. Sci.*, 2019, **116**(12), 1975–1986]

Page 1975 col 2 para lines 7 and 8

Read as:

‘.....from the oxidative degradation of another diterpene acid, agathic acid, a tricarboxylic acid that turned out to be a configurational isomer of Ruzicka’s “C11-acid”. Isolated as its triester.....’

Instead of

‘.....agathic acid, a configurational isomer, viz. the “C-11 acid”. Isolated as a.....’

Chanchal Uberoi (1939–2019)

S. N. Balasubrahmanyam

[*Curr. Sci.*, 2019, **117**(8), 1381]

Page 1381 col 1 para 3 line 7

Read as ‘the 1935 Quetta earthquake....’ *Instead of* ‘...the 1929 Quetta earthquake....’

I regret the errors.

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Addendum

Applications of geospatial technology in the management of cultural heritage sites – potentials and challenges for the Indian region

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[*Curr. Sci.*, 2017, **113**(10), 1948–1960]

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