

## The science of the earth

V. Rajamani

From the title of the editorial<sup>1</sup> I expected some excitement on the possibility of learning more about the science of the earth. After going through it I found out that it only addresses the status of earth science education (teaching and research) prevalent in India. Balaram's conclusion that 'the earth science scenario in India remains bleak' is indisputable. This conclusion was arrived at and expressed by him after every major disaster inflicted on our nation. It is not known if I would be fortunate enough to read another such unfortunate editorial considering the natural frequency of land or sea-based earthquakes.

As an earth scientist teaching and researching in the School of Environmental Sciences, I have an opinion to express through this commentary on the editorial. The editorial brings out certain facts such as (i) that the study of earth science is at its lowest ebb in India, (ii) teaching in earth science lacks the input of excitement of modern science and (iii) that the research articles in *Current Science* on various aspects of earth science are not in tune with mainstream activity of international community of earth scientists. The third aspect is rather debatable as we are not required to get interested only in the same mainstream activity of international community, as several problems in earth sciences are region specific (ex. Himalayan tectonics, Arabian Sea processes, or South West summer monsoon) and could be rigorously studied here.

Balaram seems to be right in his diagnosis on the cause of such low level of performance in earth science, in India. He had clearly stated, right in the very beginning, that physicists of India are responsible for the perception of science in India, as is common everywhere. In India, ex-physicists also have contributed to the perception of earth science here. If we must improve the level of performance in earth science, it follows, that our physicists and ex-physicists are first required to change their perception of science particularly for a long-term basis. It is appropriate to recall a familiar saying in Tamil that 'it is not the fault of a river if it does not have water'. Where does the buck stop? In the present

context, it has to be left to the imagination of the readers.

Various natural events (considered by us as disasters) with variable frequency constantly remind us of the existence of earth and the science of it. The recent tsunami was one such 'disaster'. Tsunami is a normal earth process. Coastal areas have been witnessing the tsunami phenomenon wherever the adjoining sea has a trench-arc system throughout the geological time. If tens of thousands of people die of this natural event it is largely because of human ignorance and improper regulation on land use. My visit to the tsunami-inundated areas in the east coast clearly shows the human cause of the tragedy. I also learnt from an eyewitness that only a few wild animals and tribal people of tsunami-affected areas perished. What is common between these two groups is that both of them understand the ways of nature as they did not go through our schooling system. Can we infer from this observation that we need to 'de-educate' people so that impact of such natural events could be minimized? Obviously not, because 'jobs' will disappear. The alternative, therefore, is education and that also a relevant one, i.e. earth science education to all. To improve the quality of earth education Balaram has suggested some strategies. He wants that the earth science should be modernized incorporating mathematics and physical sciences and new programs need to be started in some best institutions in the country. It is all too familiar to us that scientists in some of our best institutions who study earth science rigorously with modernized research programs are commonly more interested in awards, fellowship of academies, membership to committees and conferences abroad and less so in materially non-rewarding teaching/education (fortunately, this is not an exclusive realm of earth scientists). Further, even if a modern curriculum is developed by a few concerned (about to retire) academics, using mathematical, physical, chemical and biological tools to understand the earth system holistically, how are they going to be delivered in some major institutions without appropriate logistics and manpower? Incidentally, I find it very hard to convince

even the distinguished scientists here that the oceans and the atmosphere are integral parts of our earth and should be studied together at least in the first degree level; that these are distinct parts of the earth is also implied in the editorial. My strategy to improve the quality of education in earth science is to introduce the subject in the high school level.

If we all agree that citizens of a nation should have earth sense for them to survive in a sustainable manner then it is inevitable for them to realize that their pattern and style of living are dictated by the terms of the earth and not the other way around. For this idea to prevail in a society at least all the graduating students from our high school system should be taught in sufficient detail the basic facts of the earth system in terms of the realities of climate, secular and catastrophic processes and events, limitations of critical earth resources and the interconnectedness of rock, water, air and life on earth. This subject, earth science, should be introduced at 10 + 2 level in schools to begin with as an optional subject and eventually as a compulsory subject when adequate numbers of competent manpower have been made available. Introducing this important branch of human knowledge at the 10 + 2 level in schools will not only improve the status of earth science in India in a synergistic manner, it will also make the people of a nation better citizens with earth sense. I undertook this exercise four years ago and requested the science authorities for its implementation. If the reader wants to know what happened to this exercise, the answer lies in the reappearance of Balaram's editorial and in the absence of an earth scientist in the newly constituted National Curriculum Framework Review Committee, chaired by Yash Pal.

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1. Balaram, P., *Curr. Sci.*, 2005, **88**, 5–6.

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V. Rajamani is in the School of Environmental Sciences, Jawaharlal Nehru University, New Delhi 110 067, India.  
e-mail: rajamani44@hotmail.com