

that the academic community is polarized into two cultures, generally comes when colleagues, cutting across disciplines, brush against each other. In my experience, the biotechnologist/sub-cellular biologist asserts that he is doing 'hard science', employing state-of-the-art technology, ideas and concepts. He also emphasizes his accomplishments in fund generation by alluding to the 'crores' he has brought to the institution from national and international agencies. But if science is all about money and the paraphernalia it brings, not to mention the hype and the power to hire and fire manpower, much like the CEO of a private enterprise, then the organismal biologist usually comes second.

It can be argued, of course, that actually there cannot be any 'two cultures' in biological research and if sophisticated instrumentation, heavy funding, etc. indicate something to the effect, then it is only a superficial categorization. After all, biologists of all hues are trying to understand patterns and processes, at different levels of biological organization; some at the molecular and sub-cellular levels, others at the level of organism, populations and communities. Moreover, in our times the kind of synergy between different branches of biology is like something never seen before. While molecular techniques are being increasingly employed in ecological, taxonomic, eco-remediation and physiological work, the ecologist has much to offer a biotechnologist, say a scientist developing genetically modified varieties of plants. (Witness the recent debate on *Bt* cotton, where it was clear

that without prior ecological testing of the hybrid plants, it would be foolish to use GM seeds.) Therefore the differences, if any, are in terms of attitudes, perceptions and the importance given to certain areas at the national and international level, and also to the funding available<sup>3</sup>.

As a member of the academic community, I witness acrimonious battles whenever the two cultures clash. The battles are related as much to resources (such as space, funds, etc.) as they are to academic matters. But when biologists of one camp shout across the fence to those on the other side, asserting that theirs is the only 'true science' and what they are doing is also being done in the 'West', then I am reminded of a passage from a short story by Amitav Ghosh. The story – 'The Imam and the Indian'<sup>4</sup> – is that the author, staying for some months in rural Egypt while doing his research at the University of Alexandria, gets to confront the Imam of the village who is horrified to learn that in the Indian *doktor's* native country people burn (cremate) their dead. The Imam is particularly stung when told that even in the west, people sometimes also burn their dead. As Ghosh writes:

*(The Imam) turned around and laughed. 'He's lying,' he said to the crowd. 'They don't burn their dead in the West. They're not an ignorant people. They're advanced; they're educated, they have science, they have guns and tanks and bombs.'*

*'We have them too!' I shouted back at him. I was as confused now as I was angry. 'In my country we have all those*

*things too', I said to the crowd. 'We have guns and tanks and bombs. And they're better than anything you have – we're way ahead of you.'*

*The Imam could no longer disguise his anger. 'I tell you, he's lying,' he said. 'Our guns and bombs are much better than theirs. Ours are second only to the West's.'*

*'It is you who's lying,' I said. 'You know nothing about this. Ours are much better. Why, in my country we've even had a nuclear explosion. You won't be able to match that in a hundred years.'*

*So there we were, the Imam and I, delegates from two superseded civilizations vying with each other to lay claim to the violence of the West.*

*At that moment, despite the vast gap that lay between us, we understood each other perfectly. We were both traveling, he and I: we were traveling in the West.*

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## Interlinking of Indian rivers

According to the National Water Policy, water is a prime natural resource for humans and, hence, a precious national asset. Nowadays, it is hard to find freshwater due to growth in population, agricultural and industrial activities, and contamination of water resources. By 2020, the global population is expected to reach up to 7.9 billion and the world may be under great scarcity for freshwater. India is also expected to face water problem in the coming years. The country receives about

4000 km<sup>3</sup> of water as precipitation annually<sup>1</sup>, but due to different precipitation patterns and mismanagement, it often leads to wastage. In view of this interlinking of Indian rivers, a highly ambitious and massive project is planned, which is under debate.

Arthur Cotton was the first person who originally conceived the idea of networking the rivers about two centuries ago, but the idea of interlinking Indian rivers was revived a few decades ago independently

by M. Visveswarayya, K. L. Rao and D. J. Dastur. Recently, the Supreme Court of India ordered the Government of India on 31 October 2002, to complete this project within the next 12–15 years. In response to this order, the Government of India appointed a Task Force headed by Suresh Prabhu. Scientists, engineers, ecologists, biologists and policy makers started to ponder over the technical, economic and eco-friendly feasibility of this gigantic project costing about Rs 560,000

crore<sup>2</sup>. Before discussing the economic and social status of this project, it is essential to know the planning of this project in brief.

Basically, a large amount of water from rivers flows into the sea, which should be prevented to enable transfer of water to water-deficit areas for domestic, agricultural, industrial and other activities. The proposed project has the Himalayan and peninsular components; the Himalayan component entails construction of reservoirs and canals on the main tributaries of the Ganga and the Brahmaputra to transfer excess water to the west. The peninsular river interlinking has two components, one of interlinking the peninsular rivers themselves and the other of linking the Ganga to the peninsular rivers. Water will be transferred either by gravity flows (tunnelling through mountains) or by lifting across natural barriers.

This project has been designed with the concept that it will improve the living status of people in India, with growth in our economy. The completion of this project will result in constant water supply for domestic use, agriculture and industries along with flood control, improvement in water flow, navigation, food security, etc. Construction of dams, canals, etc. and their maintenance will create opportunities for new jobs, which will check the migration of people from villages to cities. The interlinking project is to bring an extra 34 Mha of land under irrigation using 173 BCM of additional water created in this project<sup>3</sup>. Production of hydro-power (34 gigawatts) in this project is expected, which may be inexpensive and eco-friendly<sup>4</sup>.

However, several scientists and others are worried about river diversion, which would disturb the entire hydrological cycle by stopping the rivers from performing their normal ecological functions. This project will change the composition of the sediment load, river morphology and the shape of the delta formed at the river mouth. Construction of dams and canals will get villages dislocated, flood towns and cut through millions of hectares of agricultural land. The large network of dams and canals will also alter natural drainage such that occasional flooding and waterlogging will inundate millions

of hectares of agricultural land. Moulding of natural flood-water will reduce land fertility gradually and over the years the fertile land will change into desert, affecting agricultural production. An increase in agricultural activities may result in increase in nitrogen compounds and methane, which may affect the ozone layer in the atmosphere<sup>5,6</sup>. Due to the high cost involved, there are talks about privatization of this project; but by allowing the private sector to invest in this project, the rights of the people for water resources may be affected. Before looking for a loan from the World Bank or the Asian Development Bank, it is necessary to consider whether we will be in a financial and physical position to repay the loan as we are already running in debt.

India is having water-related conflicts among its states, e.g. Haryana and Punjab, and Karnataka and Tamil Nadu. Already Bihar, West Bengal, Maharashtra, Kerala, Assam, Punjab and Rajasthan have opposed this proposal. Bihar has always argued that its water needs have not been met with from the Ganga. The proposed canals will carry water through many neighbouring states and each state will claim a portion of water, which may be a big problem to be tackled. Dams are proposed to be constructed on the Brahmaputra and Ganga or its tributaries; Bangladesh, which is a lower riparian state has objected<sup>7</sup>. Besides, Nepal and Bhutan are also expected to be affected by this project.

Some experts have proposed other alternatives of solving the water and food problems in India. Decentralized local rainwater harvesting, reviving and improving traditional techniques can meet essential requirements more effectively and at a far lesser cost. There is much scope for increasing the efficiency of the irrigation systems in place by reducing waste and through better water management. Besides, the optimal use of existing projects, traditional water-harvesting projects and recharging groundwater may be useful as alternative sources. According to UNICEF and the WWF, if the precipitation within the watersheds or sub-basins is harvested and conserved properly, domestic water needs will not be a problem in most parts of the country<sup>8</sup>.

The most important points to be considered are the cost, in comparison to other alternative methods to control water and food scarcity and the impact on our economy and the environment. The project should be undertaken with full recognition of the serious ecological damages that may be caused by interlinking rivers and that the benefits should far outweigh these costs. Interlinking of rivers should be subjected to a more comprehensive and realistic assessment. There is need for examining the pre-suppositions on which the interlinking project is based. Besides, all Indian states and neighbouring countries like Bangladesh, Nepal and Bhutan should also be brought into confidence. We should also consider the fate of interlinking of river systems in Australia during mid-1940s, which affected the environment with rivers turning saline, natural eco-system withering away, and water along the natural course of the river drying up. The side effects of this mammoth project on the environment and human beings can be avoided by proper scientific planning before its execution.

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