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EDITORIAL

Planning and serendipity in science

Planning for the future is a very respectable and essential activity. A recent visit to the Planning Commission, which is housed in a typically forbidding government building in Delhi, turned my thoughts to the role of planning in scientific activity. Meetings are often conducive to letting the mind wander, free and unfettered, sometimes to pose questions which have no simple answers. What has half a century of centralized planning achieved in a complex and populous country like India? How many of our past 'visions', documented in the turgid prose of government committees, have been realized? What indeed, is the prognosis for the many visions of the future that we are now documenting? Is 'centralized planning' a critical activity in all sectors of the liberalized economy? But, these are general questions, which presumably deserve attention in another forum. Of somewhat greater concern to an audience of scientists would be the issue of 'planning for science' and the virtues of 'planning in science'. As an aside, it is worth recalling that scientists of note were associated with the centralized planning process in the early years of the Planning Commission. While, P. C. Mahalanobis is the recognized architect of organized planning for development, another strong votary was Meghnad Saha. Indeed, the story of Saha persuading M. Visveswarayya not to accept the chairmanship of the original planning body, so that its power could be enhanced by having Jawaharlal Nehru at the helm, is recounted in the biography of C. V. Raman by G. Venkataraman (*Journey Into Light*, Indian Academy of Sciences, 1988, p. 517). But Venkataraman also quotes the feelings of Nehru himself, as the Planning Commission grew in size and bureaucratic complexity: 'When we first started it, I definitely thought it should not function as a part of the Government. But now it is just like any other part of Government. . . the same hierarchy of Secretaries, Under-Secretaries and what not – it is frightening. What was thought of as a close body of people, who think and advise Government has now grown into a huge organization, with all the Departments of Government almost duplicated there and each one sending papers to the other, which is the normal habit of Government.' (*Journey Into Light*, 1988, pp. 463–464). Today the Planning Commi-

ssion has grown into a monolithic organization, which determines budgetary allocations, at least in theory, to all areas of government. Both science and education are well represented on the Commission; indeed, the requirements of science departments are whetted here, in the complex and sometimes interminable process of decision making.

Planning for science is an activity that is important; usually dealing with the large-scale creation of institutional infrastructure for the practice of science and for the accomplishment of specific technological goals. Bombs, satellites, aircrafts, submarines and the networking of every corner of the country can be planned for. Clean water (or even more simply, water of any quality) and adequate power (nuclear and otherwise) appear harder to plan for. There are 'greyer areas' of desirable technological goals like drugs and vaccines against innumerable diseases, which are even harder to plan for, since the underlying science is still being understood. Then, of course, there are the diverse areas of basic science where 'planning' may not be an important or even desirable activity.

Can one really plan *in* science? Have not some of the most spectacular discoveries of the past appeared almost miraculously from nowhere? Has not apparently esoteric science, suddenly found dramatic application? Magnetic resonance imaging is a spectacular recent example. Is not the unexpected finding the most engaging feature of scientific research? Serendipity, a word associated with many scientific discoveries, is indeed defined as the 'faculty of making fortunate and unexpected discoveries by accident'. Royston Roberts (*Serendipity: Accidental Discoveries in Science*, John Wiley, New York, 1989) catalogs many of the 'happy accidents' in science, beginning with Archimedes. The term serendipity has an interesting origin; Horace Walpole coined it in 1754, influenced by the tale of 'The Three Princes of Serendip' who attracted 'happy accidents'. Serendip or Serendib was the anglicized version of Swarnadweepa, the old name for Sri Lanka. In examining many of science's most famous moments, Newton's discovery of gravitation, Pasteur's resolution of the chiral forms of tartaric acid, Kekule's visualization of the structure of benzene, Roentgen's discovery of X-rays and Fleming's remarkable observation of the activity of penicillin, Roberts traces the history

EDITORIAL

of serendipitous (or pseudo-serendipitous) discovery. But, he strongly emphasizes that many of the principal beneficiaries of serendipity 'clearly recognized' the difference between an accident and an accidental discovery. Pasteur put it succinctly: 'In the field of observation, chance favours only the prepared mind'. Joseph Henry echoed Pasteur when he said: 'The seeds of great discovery are constantly floating around us, but they only take root in minds well prepared to receive them.'

Planners of all kinds, those who plan *for* science and those who plan *in* science, might occasionally ponder on the many

intangible factors that help science advance; sometimes in bursts and at other times as a steady march forward. It is hard to plan for an accidental windfall, but we might plan to be well prepared to quickly recognize and exploit new discoveries. But to return to the mundane; it might be wise for science planners to ensure that the ambience in our institutions favours the survival and proliferation of 'prepared minds'. Chance might then favour us with her bounty.

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