

India – 2020: A Vision for the New Millennium, A.P.J. Abdul Kalam and Y. S. Rajan. Viking.

This is a remarkable book in many ways. It is based on a wide ranging involvement of a large number of experts to assess what India might do in the area of technology during the next twenty-odd years. It is filled with confidence that in a few decades India could become a 'great power' – an appellation I personally do not like very much, because I am not greatly enamoured of any of the 'great powers' one has seen during this century. The book is also remarkable, because it has been written by Abdul Kalam along with Y. S. Rajan, both being technologists of great passion and social concern. This I say from personal knowledge, as an old colleague and a friend for decades. Even before I go any further, let me say that this should be an essential reading, particularly for our technologists and industrialists, who at best believe in chasing, never leading. The planners, if there are any effective persons of that label still around and working with any degree of conviction, might also find it useful reading.

The book contains a wealth of data; also many projections. It should be useful for convincing most of us that we have to start running even if we want to stay where we are. There are imaginative projections of our requirements, our resources and strengths, also some lacunae and weaknesses. Superposed on descriptions of the opportunities we have missed, and things we could have done differently, is the sentiment that now we know better. The book is infused with a 'can do' feeling. Even if this optimistic tone is more a reflection of the author's enthusiasm than anything else, I am partial to such a stance.

After scanning through the book several times I am left with the exhortation that we need to move and achieve, and that if only we will we shall get there. There may not be a full consensus about where to go, but we still can get there. By 2020 we will need twice as much in food grains, four times the present milk production, two and a half times the present edible oil production, five times the present production of fruits, three times the vegetables, etc. but we can

and will get there. Our strengths in raw materials and areas of technology are pointed out. We should and can become leaders in aluminum production. We can and should do a lot more with titanium and titanium alloys, also in rare earths and metals like neodymium and its alloys. Persuasive lists of programs and projects which need to be taken up and ways of doing them are presented. The need for human resources development is also recognized, through perhaps not with as much passion as that for development of technology.

Whenever I feel that some of the basic reasons for our present state are not addressed in this unusual book, I turn some pages and I do find a sentence or two which shows an awareness in this regard. It was perhaps beyond the mandate of the various task forces set up for this purpose to examine why, for example, in the last fifty years we could not put all our children in school and retain them there, why could we not abolish child labour, or enforce land reforms, in all parts of the country while, on the other hand, we were able to design and build satellites, rockets and missiles, some nuclear reactors, even a few explosions, and do reasonably well in areas like pharmaceuticals, milk and fruit production, even food grains and oil seeds. Most of what is said in this book was not unknown, though it is good to see it all together, and that too mounted in an optimistic frame. I remember the report of the steering committee for science and technology produced for the 7th plan in 1983. That was also an optimistic report, perhaps without the benefit of the extensive work of the task forces like the book in question. That was also full of enthusiasm and insightful suggestions about the areas in which Indian science and technology could expend its efforts with profit. Some things might have happened after that but not a great deal. What has changed since then which can make us more optimistic? Many, including the authors of this book, might argue that having entered the era of liberalization and free market since 1991, stilted governmental planning will no longer act as a brake – indeed despite protestations to the contrary, planning is no longer seen as a significant requirement for developing capabilities, infrastructure or new tech-

nology. It is argued that eclipse of planning would bring in enthusiastic entrepreneurs who were earlier stymied by the so-called permit quota raj. I personally doubt that these free warriors will be much attracted to many of the programs outlined in the book under review. Or, for that matter, in any other book unless the government acts as a catalyst. I do not see, for example, an industry, on its own, getting into research and development of titanium alloys and their multifarious applications. Our industry is caught up with the low end mass consumer goods, mostly with foreign collaborations, to copy and market durable consumer items already current abroad and, therefore, with established foreign brand names. Little do they realize that what is already current is, for that very reason, on its way out. We have somewhat accelerated our pace of chasing. In the present day world those who only chase, no matter how fast, are doomed to be left further and further behind. This is how the new freedom is beginning to be used. Not one of the enthusiastic chasers or collaborators dare proudly announce a product with a claim that it is new and unique and should be bought because it is based on superior Indian technology. They do, on the other hand, proudly declare that what they are hawking is a direct kin of American, German, French, Japanese, Italian or Korean technology. Our markets may be flooded with TV sets, VCRs, washing machines, refrigerators, air conditioners, motor cars, scooters, even computers and cellular telephones, many of them assembled here, but few of them, if any, based on the know-how generated in the country. So how can we tell the outsiders that here is a special product from India which is superior in such and such a way to anything they have got. Most things we export are exportable because of the special skills and cheap labour of the poor of this country. This is true of garments, handicrafts, jewelry, gems and, sometimes, vegetables, fruits and, of course, tea and basmati rice. In addition, we do export our raw natural resources and in the process lay waste our land and even the lives of our people, often tribals, who inhabit the areas around, or down stream. This state of affairs and the currently dominant urge of our industry is unlikely to change for

several decades, perhaps not by the year 2020, because the mass of people aspiring to the so-called middle class way of living – in advertising language, *as the world lives* – is enormous; there might be enough of a market available till that time. I personally doubt that we can go even this way, because the growing disparities will rip this country apart; a few signs of this are already visible.

There are two equally dangerous passions visible in our society today. One of them is revivalist; it negates the history of how India came to be India. The other, so-called modern, would push us into a dependent version of globalization. In this we try to import pale copies of modernity for a small fraction of our people. This also requires that we would borrow dreams, ways of living, and all techniques and technologies from abroad, usually disregarding, or discriminating against, innovations in our own society. Let us look at a few examples of the last few decades:

Very few people know that India was the first country to develop and use small parabolic chicken mesh dishes and home-designed low noise amplifiers to receive and use satellite television at thousands of habitations in rural India. This was in 1975. After that there was a veritable explosion of satellite TV around the world, but none of the Indian industries thought that they could develop a large lead in this area, accelerating simultaneously the pace of research and development in the field. The space agency thought it was outside their mandate, the industry kept waiting for developments to occur abroad – after all an Indian development could not be that significant. Similarly, what was the point of taking the challenge of developing India's first Intelsat station in India, or several earth stations of ISRO, including those for the master control facility for INSAT. All these stations were made at a cost much less than import, and all of them have performed exceedingly well. Why did this not lead to the growth of a vibrant industry designing and selling earth stations all over the world? We are setting up hundreds of V-SATs in our country and thousands are working all over the world. We had a lead in this area too but we wasted it, because our industry remained mostly licensed producers, not

innovators with guts to see value and a future in things which had originated here. Kalam and Rajan have again talked about titanium. I say 'again' because we have been talking about it for years. But no industrialist comes in to do something about making specialized systems and components to sell within the country and abroad. We developed large area plastic scintillators in 1958–59. No effort was made to develop a variety of products using scintillators, in the country or abroad. We have done some of the best work on liquid crystals in our country. How come no liquid crystal display systems are produced here? Surely this is something which should have been done by an industry along with a supporting laboratory of its own. I could expand on such examples greatly but it is not necessary here. I only want to make the point that development of technology, even very new technology, in the country will not make India a leader in any field unless our industry begins to develop and use our own technology. That is a different agenda, perhaps not adequately addressed in the book under review. It is interesting to note that that we have been able to progress well only in those areas where import of technology has been denied to us!

We are all proud of what we have been able to accomplish in fields such as space, atomic energy, and some areas of computer technology, besides agriculture and pharmaceuticals. These belong in the front ranks of modern day technology. It is paradoxical that we should have done rather well in such areas, but cannot show anything radically new in other open technological areas. Our industry, public or private, has produced few products which the world seeks from us because it finds them distinct, new or superior. On the other hand, there is still demand for our crafts, jewelry, carpets, handicrafts and, of course, our music and dance. None of these are marketed, designed or produced by highly-qualified managers, designers or engineers. Most of these unique contributions come from outside of our formal system – systems implanted in the country in our quest for modernity. Indeed, it would be unfortunate if the future greatness of India, whenever it comes, by the year 2020 or earlier, is measured along the same di-

mensions and using the same scales as current in the presently designated developed world. Such a remark puts me in danger of being dubbed as a revivalist – anti-modern, anti-progress, anti-science and anti-technology. I would strongly refute such a charge. In fact I would like to seek higher levels of science and technology where, more and more, the economically desirable and socially compatible, energizes our quest for technological solutions. Technology should serve society and not the other way around. This would be a higher level of modernity, even if it is not congruent with the wash of globalization so fashionable today. We do have a different topology. I hope we will not lose it completely.

It was not the purpose of the book under review to outline the processes through which the energies of this country can be released. Only in a few mission areas, where the focus is central and effort is nationally directed, sometimes by a mega-corporation, well-defined ends can be achieved. Most other things emerge out of a bubbling society, enthusiastic and competent, the competence being self-assessed, not certified. We need to move away from management and administrative enthusiasms for recognizing only that which can be certified. Certification, by definition tends to favour those who conform to already established patterns and levels. Only mediocrity can be so certified not that which is new or revolutionary. True, everything new is not worth having, but when it is, even if rarely, it matters more than an enormous amount of mediocrity.

I have come to the conclusion that hidden in the folds of our society there is tremendous innovation, a talent which does not pass the filters of conventional certification and is not given the chance to inter-mingle with information, knowledge and analytical world of modern science and technology. A tribal child should not to be plucked out of his intimacy with plants and herbs, forests and animals – or music and dance – and yet should be able to learn about quantum mechanics, computer science and biotechnology. Such a person will be far more creative than the one who is regimented into believing that perceptions outside the classroom or laboratory are not relevant to learning and discovery.

We have tended to build a society in which learning through primal intimacies has been removed from the formal streams. The making of a desirable India of the 21st century would need such an amalgam, a seamless connection between the rich and diverse subterranean systems of learning still current in our society and the formal systems we have instituted and recognize. I believe it can happen. It will involve all that Kalam and Rajan have dreamt, and a lot more. After all we are talking of India.

This book by Kalam with Rajan is no ordinary book. It will excite, provoke and even annoy a lot of people. That is why it should be in all libraries and on the desk of everyone who dreams about the future of India. Even the controversy it generates would be valuable.

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The International Visibility of Danish and Scandinavian Research 1988-1996. Peter Ingwersen. Centre for Information Studies, Royal School of Library and Information Science, Copenhagen, Denmark. [CIS Report No. 5], 1998. p. 72.

Davidson Frame had suggested a few years ago that if one wanted to measure the volume of significant research performed by different countries, one could count the number of papers indexed in *Science Citation Index* (SCI), but if one wanted to make a more comprehensive survey then one could use comprehensive subject databases. In the early eighties, Udai N. Singh of Birla Institute of Technology, Ranchi, collected publication data from *INSPEC-Physics Abstracts* and citation data from the print version of *SCI* to map the impact of hitech physics research – holography, lasers, liquid crystals and superconductivity – in India, Israel, Canada and Australia. Singh collected the entire data manually! Peter Ingwersen has carried out an online publication analysis for Scandinavian countries, combining comprehensive abstracting services – *BIOSIS*, *Medline*, *Chemical*

Abstracts, *Psychinfo*, *INSPEC*, and *Compendex* – and the three multidisciplinary citation indexes – *SCI*, *SSCI*, and *A and HCI*. Like Paul Bourke and Linda Butler have done for Australia and Steven Katz and Diana Hicks have done for the UK, Ingwersen has provided quantitative publication indicators for Denmark and Scandinavia. While the Australian and the British colleagues devoted much time to standardize data elements, Ingwersen provides two types of publication indicators, viz. the 'Gross International Visibility' (GIV) and the 'Central International Visibility' (CIV) for all of science in Denmark as well as for nine central scientific domains. For Finland, Norway and Sweden he has provided only CIV. The GIV is the annual publication activity relative to the world (or regional) activity monitored by means of the core international bibliographic databases (such as *BIOSIS* for Biology) and citation databases. CIV is limited to publications indexed in ISI's citation databases. Ingwersen has tried hard to isolate entries that may be found both in one of the citation indexes and in the domain-dependent databases, to avoid duplicate counting. He has also compared his data with TemaNord report on science in the OECD countries, published in 1994.

Besides giving data on Scandinavia's share of the world's publications, Ingwersen provides an idea of publication productivity (in relation to expenditure on R and D). Scandinavia is strong in the life sciences, and particularly in biomedicine, with a 30% higher average publication activity, but weak in chemistry. For those who would like to have a quick glance, Ingwersen's two-page summary (Chapter 12) can give a clear idea of the major results. The large number of tables, figures, and bar charts also help. The subjects and subfields constituting the nine central domains (biology, biomedicine, clinical medicine, social medicine, chemistry, geoscience, physics and mathematics, technology, social sciences and humanities) are given in an appendix.

There are some methodological problems. Ingwersen has used *Medline* as the core subject dependent database for both biomedicine and clinical medicine. But the numbers of *Medline* entries from Denmark differ: 23,954 in the

section on biomedicine (page 26) and 12,969 in the section on clinical medicine (page 30). Besides, not all *Medline* entries can be credited to either biomedicine or clinical medicine. Physics and mathematics are clubbed and *Inspecc* is used as the core subject database. The author could have tried *Mathsci* or *Compumath Citation Index* as a core bibliographic database for Mathematics.

The book does not explain the data collection and analysis methods in detail, perhaps because the author has described them in the two journal articles given in the references section on page 62. The writing style in general could have been improved with the help of an editor.

I look forward to the author's forthcoming report on international citation impacts of Scandinavian science.

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The Book of Indian Trees. K. C. Sahni. Bombay Natural History Society, Oxford University Press, YMCA Library Building, Jaisingh Road, New Delhi 110 001. 1998. 230 pp. Price: Rs 275.

Trees are the largest, tallest and the longest living organisms that form a continuum from soil to air. Ignoring the wisdom of the tribals and the rural poor, who enjoy the blessings of trees and use them sparingly to meet their necessities, the urban societies have clear-felled trees in forests for economic assets, causing severe environmental damage and rapid extinction of biota. *The Book of Indian Trees* has come at an appropriate time when the immense value of trees is being realized as important renewable resources not merely for economic well-being but also for ecological security, tranquility and aesthetic living.

The author K. C. Sahni is a distinguished botanist, who has done research and has taught generations of Indian Forest Service probationers at FRI, Dehra Dun. He has botanized extensively in Eastern Himalaya, Andaman and Nicobar Islands, Sri Lanka and Sudan and