

any credit to the famous *wazir* Nizamul Mulk Tusi.

The most significant portion of Juzjani's chronicle, comprising last eight chapters, has been devoted to the Khwarizm Shahs, Shansbanis and Mongols. We learn that the polity of Khwarizm was segmentary in structure, as the rulers distributed the territories among their sons who ruled as autonomous chiefs. The account of Shansbanis of Ghur was characterized by freshness and objectivity, though it was composed when there was no surviving ruler who could be flattered in the hope of reward. The achievements of Malikul Jahal and Alauddin Jahansoz are followed by those of the two brothers, Ghiasuddin Muhammad bin Sam and Muizzuddin Muhammad bin Sam. Attention has been paid to the Ghurid interest in monuments and learning, with particular reference to the revival of Ghazni. The description of Ghurid wars against Khwarizm Shah is more detailed than that of their expeditions in northern India. The account of Delhi Sultans, from Qutbuddin Aibak to Alauddin Masud Shah is brief and disappointing. Juzjani employs the technique of criticizing important rulers through subtle hints, because overt negative judgement was impossible. While praising his patrons (Iltutmish and Balban), Juzjani does not fail to appreciate the merits of their rivals. This enables us to revise the existing views on Qubacha, Yaloz, Qutlugh Khan and Imaduddin Raihan. Juzjani's account of the Mongols, with reference to Chingez Khan and his successors, is quite valuable as it is based on personal experience as well reports of merchants and immigrants.

Of all the historians dealt with in this volume, Amir Khusro was the only one to have been born in India. An aristocrat to the core, he was a product of the cultural efflorescence which was manifested in the Delhi Sultanate. He benefited from the scientific rationalism encouraged by the Khaljis, while imbibing a universal humanism owing to a close association with Shaikh Nizamuddin Auliya. Though he acquired widespread fame as a Persian poet, he excelled himself in several literary genres and styles. His contribution to Persian historiography can be assessed on the basis of five historical *masnavis* and two prose works. Unlike his predecessors (Fakhr-i-Mudabbir, Hasan Nizami and Juzjani), Amir Khusro shifted focus to social and cultural life and, writing from an Indian perspective, displayed a strong sense of identity with India and Delhi Sultanate. His historical *masnavis* are devoted to political events like the conflict between Sultan Kaiqubad and Bughra Khan, the military campaigns of Sultan Jalaluddin Khalji and the rise of Ghazi Malik to power. They also illumine the cultural life of Delhi, artistic features of the fort of Jhain, techniques of warfare, progress of various sciences and Hindu religious practices. The first prose work, *Khazain-ul-Futuh*, describes the administrative reforms and

military expeditions of Alauddin Khalji, besides the topography of towns. The significance of the second prose work, *Ijaz-i-Khusravi*, lies in specimens of documents – *farmans*, *fatehnamas* and *arzdashts* – offering advice to the ruling class on dealing with the Mongols, *zamindars* and traders. He lauds the measures for price control and advocates religious freedom for non-Muslims. Surprisingly, he disapproves the appointment of low born to public offices, caricatures the Afghans and indirectly criticizes the Deccan policy of the Khalji rulers. In Siddiqui's view, Amir Khusro had little interest in the past and excelled in describing contemporary conditions.

This book is an important contribution to the study of the Delhi Sultanate. It examines not only the content of the major historical writings of the thirteenth century, but also places them in their respective historical contexts. It identifies the outstanding aims and concerns of the writers, with reference to the prevailing system of patronage. It does not hesitate to caution us regarding the prejudices and limitations of the writers. It provides English translations of numerous passages from the original texts, so that we are able to understand their nature, style and importance. The book, while confirming the reputation of Siddiqui as one of the most prominent medievalists of South Asia, promises to illumine the path of students of medieval Indian history.

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B.V. Sreekantan, ed., *Science, Technology and Society*, Shimla: Indian Institute of Advanced Study, Shimla, 2009. Pp. xiv+202, Rs. 350.

The book is a collection of papers presented at a three day national seminar on 'Science, Technology and Society' jointly organized by Indian Institute of Advanced Study, Shimla and National Institute of Advanced Study, Bangalore during 26-28, March, 2006. The aim of the seminar, in the words of the editor "was to bring to focus the series of problems that the Indian Society is facing which are becoming more acute day by day which however can be solved or mitigated to a large extent by judicious and timely application of Science and Technology." The papers have succeeded in realizing this aim.

The area of 'Science, Technology and Society' studies is an established academic discipline in the western universities. The area concerns the interaction between scientific and technological ideas and practices, on the one hand, and the social factors and forces, on the other. Focusing on the Indian context such an undertaking can

be very stimulating and challenging due to the specificity and uniqueness of the issues to be addressed. Not surprisingly the area of 'Science, Technology and Society' studies in the Indian context has witnessed a steady growth of literature which is impressive in terms of the breadth of scholarship and depth of analysis. The book under review is a commendable addition to such a literature.

The impressive features of this collection are:

1. the wide canvas of the focal theme which includes almost all core domains of the Indian scientific and technological endeavour; in fact, the breadth of the canvas has compensated for the absence of thematic unity;
2. technically competent articulation of the achievements and challenges; and
3. clarity and lucidity of presentation that make an esoteric area accessible to a non-specialist. Moreover, the inclusion of papers on science and technology education has broadened the focus of the book. Before coming to some overall critical observations, a few words about some of the papers are in order.

Professor V.K. Atre in his paper lucidly brings out the nature and the promise of micro-system technology at the core of which lies the development of smart materials. He underscores the radical change in the nature of technology best exemplified by the success of miniaturizing the technological gadgets. Prof. Atre graphically describes the multifarious application of smart material technology whose scope is limited only by our imagination. India could not participate, for historical reasons, in the world transforming process we call 'Industrial Revolution.' In fact, we missed the silicon revolution too. However, we can more than compensate for the missed opportunities by taking up in a big way an initiative in ushering in the micro-system technology which is only a decade old and Indian technologists are working in that direction for the last five to six years. According to him, "If we miss this revolution also. . . we would have missed most of the main technological revolution". The significance of Professor Atre's contribution lies in pin pointing one of the directions which is promising in so far as the innovative possibilities of Indian science and technology are concerned. However, Professor Atre could have explored the factors that might possibly come in the way of utilizing this crucial opportunity.

Professor Sukumar Banerjee provides a graphic account of Indian achievements in nuclear technology. For a non-expert he has effectively portrayed its

application not only to energy sector but also to health care, Agriculture, Food processing and industry. While convincingly showing that the Indian scientists and technologists did strive for self-dependence in nuclear technology and are even capable of sharing certain important items of that field with others, he acknowledges that the real breakthrough in our endeavour comes only when we attain self – sufficiency in nuclear fuel – a possibility that can be realized only by building thorium based reactors. However, granting that it takes a few decades, how far are we in building at least a prototype of thorium-based reactor? Professor Banerjee could have dealt with the question whether our effort in that direction has matched the urgency. That the Indian space programme has been the most successful one is widely accepted. Professor Kasturirangan very ably substantiates such a view. But, more importantly, he deals with the question of deploying this new science and technology for societal development in a country with its specific geographic location, natural setting and resources. The author has striven to enlighten those of us for whom space programme is only about rocket launching not knowing what for. He has brought out the possibilities of its application to the problems concerning disasters, detection of mineral resources, management of natural wealth and more importantly, harnessing it for education and health care. After reading this paper one wonders whether our space programme can be a role model for the rest of our science and technology initiatives.

Professor Sukumar Devotta's paper confronts head - on the most urgent problem India is facing, viz, the environmental degradation. He has done justice to this gigantic challenge by taking into account all aspects of this crisis. In our over zeal for production our callousness towards environmental protection has cost us what we cannot even fathom accurately. The principle of 'Polluter pays' hardly works with us. Particularly instructive in this connection is the author's attempt to explode certain myths. For example, we believe that hydro power is safe, not knowing that dams produce as much methane as carbon-di-oxide. After drawing our attention to the fact that the future fuel will be hydrogen on which our work, surprisingly, is minimal, Professor Devotta makes a case for new industrial model wherein the waste from one is a raw material for another. The question remains whether we should have industries whose waste can not be raw material at all. This question indicates the need to initiate a new model of industrialization which is radical because it first involves substantial amount de-industrialization. The ushering in of the knowledge economy organically linked to globalization has provided India a challenge

and an opportunity. Professor Rama Rao and Prof. Anitha focus on this phenomenon and in doing so reflect on our higher education system in general and university education in particular. The institutes of higher education need to undergo drastic changes in order to be vehicles for India's transition to a knowledge intensive society. They need to be the resource base for scientifically trained manpower without which mere increase in the Raw & D expenditure will be inconsequential. Transforming enormous human resource, which India is sumptuously endowed with, into human power that creates wealth demands that university system increase its capacity for absorbing more persons and enhance the quality of education imparted to them. The authors are optimistic about the possibility of raising the number of Ph.Ds to the level of the US, though such an increase is not on the agenda of those who manage the higher education system in India. The paper is highly instructive regarding both the qualitative and quantitative aspects of higher education as it stands today. The authors should have discussed, apart from the emerging social ethos of the new middle class that has an antipathy towards 'hard' and non-remunerative options like pure science and high technology, the negative impact of the inadequate school education both in terms qualitative adequacy and quantitative spread. The brute fact that state-run schools are becoming dysfunctional and private schools are inaccessible to the overwhelming majority of our people makes a mockery of our educational planning. And equally importantly, the authors should have focused on the less than desirable conditions of college education which seems to be the weakest link in the whole chain of education.

Professor Mukunda's paper gives an account of the steps taken by bodies like Indian Academy of Science to provide a wholesome and effective science education by organizing workshops and refreshes courses and initiating new programmes like Integrated Master's programme and Integrated Ph.D. programmes. Such steps can be excellent supplements to a rigorous college education in science in whose absence those steps become inadequate, it not cosmetic, in stemming the rot. We all agree that human resource is to India what oil is to the middle eastern countries and the former, unlike the latter, is not exhaustible. But the state of our school education and college education hardly inspire any confidence in our endeavour to build a rich human resource base. The products of such a system are bound to put serious limits to whatever we do at the post-graduate and research level.

Professor Rama Rao and Prof. Anitha rightly underline the need for bridging the gap between universities and

agency laboratories as an important step for universities to become more than purveyors of knowledge and achieve the status of co-producers of knowledge. But this is an uphill task given the orientation that our universities have inherited. This would not have been so if research was not placed in the early years outside the agenda of university education. In his debate with Homi Bhabha, M.N. Saha insisted upon making universities the loci of both pedagogy and research. But the views of Bhabha prevailed. Along with education, health care stands as a pillar of a sustained development of human wealth. The crisis in health care is deeper than the one in education. No doubt we have been able to increase life expectancy, eradicate several deadly diseases and control epidemic disasters, as the 2006 report on the Commission on Macroeconomics and Health informs us. But such achievements are more than offset by the stagnation one witnesses in reducing malnutrition, infant and maternity deaths.

Professor M.S. Valiathan's remarkable paper hits the nail on our pretensions in health sector. Having 16.5% of the global population, India's share in the disease burden of the world is 20%. The main source of the crisis is poverty which "aggravates illness which in turn drives people into penury". Ill health is the surest way of transforming poverty into destitution.

Though technology is only one of the many factors in the health care system, the intensive and extensive application of technology has altered the system beyond recognition; India's achievement in coming to terms with the technological transformation of its health care system has not been even modest. As Professor Valiathan notes, "While India imports 45% of the total requirement for medical technologies, the percentage risen to 95% in the high technology segment". The reason is our pathetic performance in the field of medical instrumentation. No doubt innovations take place in the India based R and D laboratories owned by Multinational corporations. Such innovations are the results of the labour of Indian scientists and technologists. But such innovations are of no consequence to India itself since the labour of its scientists and technologists do not at all add to the indigenous knowledge capital. In fact, the MNCs raise the price of equipments by 70% for sale in the very developing countries where the equipments were innovated. The result is the phenomenon of five star hospitals for the wealthy while the less fortunate are left to their fate. Such polarisation can be a greater threat than any imaginable epidemic. Professor Valiathan draws our attention to Dr. Sikka committee report which analyzed this grave scenario. The committee recommended ways of mandatory participation of academia and industry in

all R and D projects pertaining to medical instrumentation. It also insisted upon a mission mode approach to overcome the bureaucratic hurdles which can set at naught a nascent industry.

On the whole the book provides a clear and delete candid account of the Indian endeavour in science and technology – the tasks achieved, challenges ahead, potential capabilities and countervailing factors. The fact that the views presented are based on experience and reflections of the insiders lends the work an added significance. It deserves to be read by the practitioners of science and technology in our context. Also, it is an indispensable text for a core course in 'Science, Technology and Society' Studies programmes in India. However, one feels the conspicuous absence of papers by historians of science and sociologists of science. There is hardly any critical discussion in the book on the historical factors, pre-colonial or colonial, that have a bearing on the current situation in Indian Science and Technology. Secondly, we do not have a well worked out response to the negative reception by grass- roots workers and some sections of our society to some of the technological applications to the domains like agriculture and health. Thirdly, one expects an informed position regarding the conditions under which the deployment of a technology becomes economically viable. For instance, one needs to know within what limits nuclear technology is economically viable and in what ways it needs to be supplemented by alternative energy sources like, say, solar energy, the research work on which should have been started long back. Fifthly, though none of the authors believe, we may be sure, in the naïve 'Use-abuse' theory of science and technology (i.e. the discredited view that science and technology are in themselves good though they might have been misused / abused by some vested interests), there is hardly any reflection on the lessons we have learnt from the western experience that shows how science and technology can be easily made to serve, with impunity?, the interests of the military – industrial complex that can undermine democratic ways of life, individual and collective. More surprising is the complete silence regarding how far science and technology in India have promoted the goal of national self – reliance which was top on the agenda of independent India. Even more importantly, the reader is not enlightened about the role of modern science and technology in India in delegitimising non-modern knowledge systems that still sustain the lives of the bulk of our people and which were so well anchored in the material and cultural practices of our people that even the imperialist onslaught could not decimate them. Finally, a reader interested in the theme expressed by

the title of the book has to look elsewhere to get some clues regarding the organic link between the kind of science and technology we promote and the kind of society we envisage. It is because of the issues such as these that questions about science and technology are too important to be left only to scientists and technologists. Is it not time that the potential members of science and technology profession in India be exposed to such seminal issues right from their graduate training?

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Jagdish N. Sinha, *Science, War and Imperialism: India in the Second World War*, Leiden and Boston: Brill, 2008, Pp. iv + 278, \$ 79.00 (paperback)

"This is an extremely lucid and significant work, which elaborates certain aspects of "Organising for Science" in a new way. It focuses on the elaborate linkages between the colonial state and the appearance of elite cadres of scientists who established the paradigms of Science as an aspect of nation building. The new readings Jagdish Sinha provides us is with regard to the background to this endeavour, which is located around the questions of the significance of agriculture to the colonial government. The emphases on agriculture which Lord Curzon insisted on, was then replaced historically during the years of the Second World War, by the technological drive to a scientific domain which was seen to be consistent with modernism. It now made no distinction between peace and war in the quests of science as progress. The history of institutions is carefully mapped in this new book for new readers. The colonial government establishes links with dominant industrial families. "While these measures led to an unprecedented industrial growth and expansion, they did not necessarily imply any significant innovation and research," (p. 70). However, Ramaswamy Mudaliar realised the value of industrial research, and set up Board of Scientific and Industrial Research in 1940, under the department of commerce. J.N. Sinha tells the story in a detailed way, with many footnotes and references, each allowing the reader to follow up the complex trail for himself or herself. It may not be an original work, drawing on both well known classics in the Sociology and History of Science Policy, but it is a major work, where the art of splicing and configuring secondary as well as primary materials, leads us to important questions about the new canvas, that the Sociology of Science increasingly leads us to. Unfortunately Brill has overpriced the book, as a statement on the neocolonialism in academia and the