ending poverty where socialism, communism, and revolution have failed. We hear Gandhi in Kothari's arguments here, duly cited; but Kothari does not tell us that this very same line of argument has been embraced by the World Bank and many other international funding agencies.

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Science and the Raj, 1857–1905. By DEEPAK KUMAR. Delhi: Oxford University Press, 1995. xv, 273 pp. $26.00 (cloth).

Technology and the Raj: Western Technology and Technical Transfers to India, 1700–1947. Edited by ROY MACLEOD and DEEPAK KUMAR. New Delhi: Sage, 1995. 348 pp. $32.00 (cloth).

Colonialism, Chemical Technology and Industry in Southern India, 1880–1937. By NASIR TYABJI. Delhi: Oxford University Press, 1995. ix, 242 pp. $26.00 (cloth).

Scholars usually bemoan the "surprising" absence of work in some particular field in order to legitimize their own contributions that unsurprisingly happen to be in the area which has allegedly not been covered by existing studies. However, given the rich analyses of literally every facet of colonial rule in India, the lack of serious studies of the intersection of colonialism with science and technology is genuinely surprising. To be sure, occasional publications by Claude Alvares, Vandana Shiva, Susantha Goonatilake, and Ashis Nandy, among others, vehemently attacking "Western" science in general or lamenting the premature death of an epistemologically distinct "Indian" science as a consequence of British colonial rule, have appeared and have been duly absorbed by metropolitan universities avidly seeking to add appropriate doses of "multicultural" gloss to their curricula. What most of these studies share is a valorization of a populist, third worldist, "indigenist" rhetoric, the pitch of which is inversely related to the empirical evidence at hand.

In marked contrast to the above mentioned tracts, the three books under review genuinely seek to rectify the existing state of affairs. Rather than being content with the banal demonstration that historical accounts are socially constructed, as if any practicing historian is not aware of this truism, these three volumes get on with the task of filling in the amazingly wide gaps in our knowledge of the dynamics of science and technology in the colonial era. Kumar's *Science and the Raj* provides a detailed and comprehensive macro picture and analysis of the various levels at which British colonial imperatives—economic, political, strategic and cultural—interfaced with science and technology in India between 1857 and 1905. Kumar's important book represents one of the few serious attempts to develop an account that is firmly grounded in a wide range of primary sources. Indeed, Kumar tells us that he "enjoyed working most on archival sources, though some friends warned me that these tools were conventional, official, ancient and so forth" (p. 239). Looking at the results of Kumar's work, one can be thankful that he refused to be seduced by the aura of the

ever proliferating range of arid theoretical abstractions available on the postcolonial menu.

Spanning roughly fifty years of the Raj, Kumar's narrative represents the most complete, thorough, and meticulous account available yet of the mobilization of strategies, contestation, and resistance over the introduction of science and technology in colonial India. Deploying the concept of "colonial science," made popular by Roy MacLeod and defined as "a dependent science wherein the result-oriented research in applied science heavily supersedes the curiosity-oriented research in pure science" (p. 1), Kumar's general argument is that colonial imperatives contributed to the specific characteristics of the type of scientific and technological institutions inherited by India and whose ramifications continue to be echoed in contemporary India. Although the colonial rulers were well aware of the importance of science and technology as constitutive elements of control and exercise of power, Kumar argues that the early phase of colonial rule offered a relative degree of autonomy to aspiring colonial scientists, a space that was severely constricted after 1858. One of the consequences of the almost total subordination of scientific and technological endeavors to economic and strategic colonial imperatives was the development of the peculiar form of "colonial science" that led to a lack of encouragement of "pure" science and theoretical issues. Although a number of Indian and British scientists, helped by their Indian assistants who played a major role in the process, managed to work on theoretical issues and came up with major discoveries, the prevalent atmosphere actively discouraged research that did not fit within the narrowly defined areas of colonial strategies.

Despite individual initiatives on the part of specific administrators, fundamental research was not encouraged, and in the generalized colonial division of labor, most scientists as well as the administrative hierarchy looked to Britain as the appropriate site for the analysis of data gathered in India. British scientists like Thomas Oldham, George Watt, and Ronald Ross—the latter who, with substantial help from his Indian assistant Muhammad Bux, is credited with having identified the vector for malaria—worked under extremely frustrating and discouraging circumstances. As Ross put it, "the Government of India is a mule as regards science . . . it won't do anything unless driven" (p. 176). The frustration, as far as these scientists were concerned, was the lack of space outside perceived colonial imperatives. Undue attention was accorded to fields like botany, geology, and geographical surveys which were deemed to be significant from a commercial and strategic point of view, while other fields like zoology, medicine, and so on were relatively neglected. As A. W. Alcock, a zoologist who, like Alain Ross, resigned in frustration, commented, "we zoologists feel hurt at being treated like the musty old museum mongers of a century ago, whose little lives are surrounded with stuffed skins and cabinets of butterflies and shells, and who in other affairs were as hapless as owls at mid-day!" (p. 176). In 1902, an aspiring botanist was advised by his superiors that "for the present it will be a good policy on your part to leave the counting of organs of *Ranunculus arvensis* and such like amusements to Scotch Professors of Botany and ply Government with roseate agricultural reports" (p. 231). A similar situation, compounded by explicit racist barriers and lower salaries than the British scientists with inferior qualifications, was faced by a later generation of Indian scientists like P. N. Bose, J. C. Bose, and P. C. Ray, but they chose various strategies of resistance to expand the limits of the space constructed by colonial imperatives (pp. 180–227). A number of local societies and organizations, supported by Indian donors, sprang up in various parts of the country to provide support for scientific endeavors. The ultimate trajectory of science and technology in India was a

result of the contested process of colonial interests, the strategies of resistance by scientists, Indian and British.

For Kumar, the overwhelming factor in the constitution of scientific and technological institutions in India was the country's status as a dependent colony. The use of English as the medium of instruction in the engineering and other educational institutions "widened the gulf and accentuated the age old divide" (p. 233). Kumar contrasts the situation with Japan, where the use of Japanese in schools ensured that "modern knowledge and the scientific spirit could percolate down to the masses" (p. 233). As opposed to this, confronted with structures of colonial power, India was deprived of a "higher form of techno-scientific education" (p. 233). Kumar also contrasts India with settler colonies like Australia and Canada, where basic scientific research was encouraged and a number of major scientific organizations made all the difference in scientific and technological developments. He argues that the relative failure of modern science and technology to strike roots in colonial India cannot be explained by invoking the "cultural stagnation" or "social conservatism" of Indians (p. 238).

Overall, Kumar's book, based on extensive familiarity with the primary sources, sets new standards for historians and historical sociologists of India. The book stands out as one of the first to consider in detail the nuanced and at times contradictory response of the colonized to scientific and technological initiatives (or lack thereof) from the top. Although ultimately, the overall tenor of his account appears to be a bit top-heavy, Kumar has succeeded in constructing an accurate narrative of the power, contestation, resistance, and reconstitution that shaped the contours of colonial science and its legacy for contemporary India. There are a number of minor problems that in no way detract from the enormous contribution Kumar's book makes to the historiography of science in India. An extensive quote attributed to William Roxburgh (p. 66) is actually from William Jones. Given the extensive amount of research in the sociology and anthropology of belief systems, a number of his formulations sound rather quaint—"there is no doubt that most Indians were (and perhaps still are) grossly superstitious" (p. 58); "a country . . . where superstition and science perhaps mingled more freely than anywhere else" (p. 190), "even the poor and illiterate peasants were found fairly intelligent and adaptive by several European observers" (p. 223). Finally, Kumar's question, although mentioned in passing and no doubt rhetorical in intent—"could the integration of technological and scientific traditions have taken place as part of the natural evolution of the Indian society had colonization not intervened" (p. viii)—raises a host of contentious issues. What, one might ask is meant by the "natural evolution" not just of Indian, but of any society? Does the term have any academic value for making sense of the impact of colonial rule on societies? Was colonialism "unnatural," outside history, or constituted by a constellation of eminently social and historical contingencies and structural trends both within societies that emerged as colonial powers and others that were colonized?

Technology and the Raj continues the high standard of historiography set by Kumar and comprises a dozen papers by as many scholars on the transfer of specific technologies and its consequence for Indian society. Ian Inkster uses the example of the introduction of railways in India to reflect on the reasons for the failure of this "technology project" to evolve into a "technology system." R. J. Henry goes against the grain by arguing that colonial administrative policies, although influential, cannot be isolated as the only factors that inhibited the successful transfer of technology to India. Convincingly arguing that analysis should move beyond simply pointing out the limitations of colonial administration, he focuses on a range of social and economic

barriers inhibiting modernization of the sugar industry, among others. S. Ambirajan examines policies relating to science and technology education in South India and cautions against the tendency to characterize these initiatives as consciously designed purely for "ruthless exploitation." He argues for taking into account the unintended consequences of large-scale bureaucratic organizations propelled by "bureaucratic momentum."

Other interesting papers include: Satpal Sangwan's account of the destruction of the Indian shipping industry; S. Irfan Habib's reconsideration of the various alignments behind the Indian elite or the *bhadralok* over the content and trajectory of industrial development; Dinesh Abrol's critique of scholars who seek to label Meghnad Saha and other scientists associated with the journal *Science as Culture* as exemplars of "colonised minds"; V. V. Krishna's important discussion of the origins of the Council of Scientific and Industrial Research in the late colonial period and its legacy for research in contemporary India; Saroj Ghosh on the military and commercial imperatives behind the introduction of the telegraph system; Ian Derbyshire on the role of colonial India as a testing ground for a number of institutional experiments in the sphere of railway technology; Arun Kumar on the intimate connections between the evolution of engineering education and the interests of the Public Works Department; Jagdish Sinha on the collaboration between scientists, politicians, and industrialists in the emergence of the National Planning Committee; and Nasir Tyabji on the social and economic factors influencing the fate of oilseed technology in Madras Presidency.

The introduction by Roy MacLeod and Deepak Kumar provides a good overview, and, although they raise the "Needham question," unlike Alvares, Nandy, and others, they wisely refrain from offering any answers. They rightly contend, "before new generalisations are possible, more work is needed on sources in classical languages" (p. 12). Their occasional use of the term "Western technologies" (p. 15) is jarring and anachronistic, and the bibliography confuses Irfan Habib, the Aligarh historian, with S. Irfan Habib who has contributed to the collection. The volume constitutes a useful benchmark and indicator for the state of the art in the history and sociology of technology in colonial India.

Nasir Tyabji's *Colonialism, Chemical Technology and Industry in Southern India* is a focused monograph that adopts a multilayered analytical strategy to resolve a paradox: Although Madras presidency received the most support for industry by the colonial government, it lagged far behind Bengal and Bombay in terms of industrial performance and technological development. Focusing on the constraints of specific colonial policies, the structure of the economy and niche markets for specific commodities, and the nature of technology in particular industries, the author provides a sociohistorical account of Madras Presidency.

Bengal's main industry during the colonial period was jute and Bombay's was cotton. Both commodities had extensive niche markets in the imperial commercial system. Bombay's textile industry had a key role in the China-Britain-India triangle; the jute industry had a monopolistic position as a consequence of the relocation of manufacturing from Dundee to Bengal. In contrast, although oilseeds from Madras were freely imported by France and Germany in particular, edible oils themselves were heavily taxed. Such policies, despite the official encouragement of industrialization, proved to be major barriers to the development of an oil-milling industry in Madras, although it constituted a major center for more complex commodities based on oilseeds. The restrictions on markets for the finished product—edible oil—proved to be a major factor that inhibited the rise of chemical engineering technology because

much of the export consisted of unprocessed cash crops like oilseeds, rather than processed oil. Like *Science and the Raj,* Tyabji's account is supported by extensive use of primary sources and will be invaluable for scholars pursuing the hitherto neglected area of changing technological relations during colonial rule.

All three volumes are genuinely groundbreaking at various levels and will open up fresh avenues for research in a glaringly neglected aspect of an otherwise well-researched period of Indian history. No doubt, the amount of data collected here will also come in handy for the new breed of scholars who constitute the traveling circus for whom archival research is anachronistic in an era of glib "postcolonial interventions and interrogations."

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Mawlana Mawdudi and the Making of Islamic Revivalism. By SEYYED VALI REZA NASR. New York: Oxford University Press, 1996. x, 222 pp. $45.00 (cloth).

In an ongoing contestation and immensely complex relationship between Islam and modernity, analysts more often tend to see them as two poles apart. In fact, despite the diverse praxes of two divergent trajectories, the dividing line in recent years is not so clear-cut, with significant common ground covered through an unacknowledged mediation. The articulation and strategic implementation of Muslim modernism, as typified by great thinkers and activists like Al-Afghani, Mohammad Abduh, Syed Ahmed, Mohammad Iqbal, Amir Ali, and Fazlur Rahman, does not outrightly reject the revivalists like Syed Mawdudi and Imam Khomeini. From academic discourse to interdenominational debate, especially in the South Asian context, Syed Mawdudi (1903–79), the founder of the Jama'at-I-Islami, has remained an enigmatic figure. To his followers, he was a *mujaddid*—sometimes a Mahdi—an Islamic revolutionary and the most preeminent and original philosopher of the twentieth century. For his critics—and they, too, are numerous, varying from politicians to ideologues and ulama—he was a fundamentalist, a spoiler, and an extremist of a sectarian kind. To several nonpartisan observers, Mawdudi was an Islamic revivalist in a puritanical sense, lacking immersion in modernity, while to a similar group of Islamists, Mawdudi, despite an analytical mind and sincerity of purpose, reflected an intellectual confusion amongst the Muslim elites bordering on self-placation coupled with aggression towards others.

Seyyed Vali Nasr's study of this most controversial Muslim scholar of our times is neither a work in apologia nor an attempt at demolition. Mawdudi, after all, reemerges not as a rejectionist but a shrewd political activist imbued with great energy, penetrating analysis, and organizational acumen. Mawdudi, simultaneously, is an idealist and a programmist. He debunks traditionalist ulama as the custodians of Islam; identifies Muslim history after the Pious Caliphs merely as a mundane *Muslim* past; rebukes mysticism and scholastic rhetoric and shores up his energies to defy the state (both colonial and national) so as to assert his critique of alien control, territorial nationalism, and modernist totalitarianism.

Mawdudi, apparently a calm, self-assured activist, seems to be fighting on several fronts yet, in the process, does make strategic compromises. The sustained hostility from the ulama and the state does not stop him from changing his opinions even to