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# China, the West, and World History in Joseph Needham's *Science and Civilisation in China*\*

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Long before the death of Joseph Needham in 1995 at the age of ninety-four, his *Science and Civilisation in China* was acclaimed as one of the monumental achievements of twentieth-century scholarship. One reviewer greeted the first volume in 1954 by declaring that Needham's project represents "perhaps the greatest single act of historical synthesis and intercultural communication ever attempted by one man."<sup>1</sup> When the twenty-eighth and last text in the series comes out sometime in the next ten years, the volumes will provide an encyclopedic survey of Chinese achievements in almost all areas of science and technology—physics, astronomy, metallurgy, chemistry, botany, agriculture, biology, language, geology, ceramics, and sericulture.<sup>2</sup>

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\* A version of this paper was presented at Gonville and Caius College, Cambridge University, in April 1999. I am grateful to Ethel S. Goodstein, William H. McNeill, and an anonymous reviewer for their valuable suggestions and criticisms. I wish to thank John Moffett, librarian of the East Asian History of Science Library at The Needham Research Institute in Cambridge for graciously allowing me access to materials in his collection. I am also greatly indebted to Jin Jiang for her assistance in dealing with materials in Chinese.

<sup>1</sup> Quoted in Mark Elvin's introduction to a symposium on *Science and Civilisation in Past and Present* 87 (1980): 17.

<sup>2</sup> Joseph Needham et al., *Science and Civilisation in China*, 7 vols. in 15 parts (Cambridge, 1954–98) (hereafter cited as SCC). Volumes 1–4, part 3 (1954–71) are by Needham, working with research assistants and collaborators. Part 1 of volume 5 (1986) is the first portion of *Science and Civilisation* for which his role was mainly supervisory rather than substantive; parts 2–7 of volume 5 (1974–86) are by Needham and collaborators. The subsequent volumes, part 9 of 5 (1988), parts 2–3 of 6 (1986–96), and part 1 of 7 (1998) are by independent scholars following lines laid down by Needham. Only volumes by Need-

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Nothing like it exists for the history of Europe, and, given the special conditions that produced Needham's masterwork, it is unlikely that there ever will be.

One of the greatest scholars in the comparative study of civilizations, Needham discovered an entire realm of knowledge—"a veritable gold mine, a cornucopia"—and made it available to the world.<sup>3</sup> He possessed intellectual energy, passionate convictions, and a genius for relating seemingly disparate subjects to one another. He drew together the most recondite details on science and technology into a powerful narrative focused on cross-cultural integration and human progress. He combined an overwhelming affection for China with the glowing confidence that its scientific values remained essential for the future of humankind. Since he believed that scholarly study, political principle, and social responsibility were necessarily connected, he saw his mission in *Science and Civilisation* as providing the world with access to the wisdom of China. As he explained, "I think that everyone who undertakes a big inter-cultural job like this must naturally project his own vision of beliefs in doing so—it is his opportunity to preach (and I use the word advisedly) to his own and later generations."<sup>4</sup>

Any scholar working on such a spacious scale is open to attack on many fronts. From the appearance of the first volume, Needham was criticized for his methodology, his Marxist premises, his understanding of Chinese culture, and his insistent equation of science and technology.<sup>5</sup> In particular, he was faulted for claims related to the comparative

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ham himself shall be dealt with here. For a list of Needham's collaborators to 1981, see Joseph Needham, *Science in Traditional China: A Comparative Perspective* (Cambridge, 1981), pp. 4–6. On the production of *Science and Civilisation*, see Gregory Blue, "Joseph Needham—A Publication History," *Chinese Science* 14 (1997): 92–95. A thirty-four page list of works by Needham related to *Science and Civilisation* is appended to Blue's essay.

<sup>3</sup> The quotation comes from Needham's description of the neglected field of Chinese science; Needham, *Science in Traditional China*, p. 4.

<sup>4</sup> *Ibid.*, p. ix.

<sup>5</sup> Not surprisingly, *Science and Civilisation* has received virtually no criticism from scholars outside the fields of science, the history of science, and sinology. See the bibliography in Nathan Sivin, "Why the Scientific Revolution did not take place in China—or didn't it?" in *Transformation and Tradition in the Sciences: Essays in Honor of I. Bernard Cohen*, ed. Everett Mendelsohn (Cambridge, 1984), p. 551 note 7. For the most thorough appraisals, see Derk Bodde, *Chinese Thought, Society, and Science: The Intellectual and Social Background of Science and Technology in Pre-modern China* (Honolulu, 1991), pp. 332–55; Toby E. Huff, *The Rise of Modern Science: Islam, China, and the West* (Cambridge, 1993), pp. 32–39, 237–320; H. Floris Cohen, *The Scientific Revolution: A Historiographical Inquiry* (Chicago, 1994), pp. 418–85; Wen-yuan Qian, *The Great Inertia: Scientific Stagnation in Traditional China* (London, 1985); Gregory Blue, "Science(s), Civilisation(s), Historie(s): A Continuing Dialogue with Joseph Needham," in *Situating the History of Science: Dialogues with Joseph Needham*, ed. S. Irfan Habib and Dhruv Raina (Oxford, 1999), pp. 29–72.

historical framework which he employed in his study. Needham asserts that scores of Chinese innovations were transmitted to the West, including observational astronomy, efficient equine harness, equal temperament in acoustics, the mechanical clock, the hot-air balloon, the binomial theorem, the magnetic compass, grid maps, and systematic alchemy.<sup>6</sup> Some reviewers chalked this up to “the exaggerations of a lover.”<sup>7</sup> It was far more than that, however. In Needham’s view, the Far East’s precedence and influence were intrinsic to the nature of world history, to the cultural dialectic played out between China and the West. Technological innovations did not disrupt Chinese civilization, which remained secure in its imperial structure and Confucian principles. Yet when those innovations flowed into Europe, they overturned its social and intellectual order, stimulated capitalism, inspired the Scientific Revolution, and were a proximate cause of Westerners establishing world hegemony in the period from the doubling of the Cape of Good Hope by Vasco da Gama in 1498 to British aggression against China in the Opium War (1839–42). “Thus did the inventiveness of the Chinese reverberate and recoil across the length of the Old World.”<sup>8</sup>

For Needham, China and the West are antithetical in their values and social dynamics, the Yin and Yang of the Eurasian hemisphere. A vision of world history based upon their relationship shaped the making of *Science and Civilisation*, which may be regarded as a celebration of Chinese accomplishments which also functions as a critique of Western civilization. Needham’s conception of world history has gone unnoticed, however, and most readers certainly are not aware of a large-scale historical scheme informing the massive detail of *Science and Civilisation*. This perception is mainly a consequence of the expansion of the project. Needham originally planned to write a final volume which would examine Western and Chinese civilizations with a view to explaining the origins of modern science in Europe rather than in the Far East. He intended to discuss the environmental, social, and political background of scientific developments in each society, as well as the relations between East and West. This would have consti-

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<sup>6</sup> Inasmuch as the present discussion focuses on Needham’s conception of world history, his assertions about technological diffusion are taken as given (except in the concluding section).

<sup>7</sup> Lynn White Jr., in a review symposium on *Science and Civilisation*, *Isis* 75 (1985): 174; see also William Watson, “History and Technological History,” *Antiquity* 47 (1973): 185; Shigeru Nakayama, *Academic and Scientific Traditions in China, Japan, and the West*, trans. Jerry Dusenbury (Tokyo, 1984), p. 83.

<sup>8</sup> SCC 5/7:10.

tuted his fullest statement on world history. But as the volumes of *Science and Civilisation* multiplied, Needham finally abandoned hope of producing the culminating one himself. To discover his view of world history, one must go to scattered discussions and suggestions in *Science and Civilisation*, as well as to numerous papers which Needham produced as his great venture moved forward.<sup>9</sup>

It is worthwhile trying to construct the broad pattern of Needham's historical thought for three reasons. First, as both his critics and admirers have pointed out, Needham never shied away from bold generalizations. Even though he employs many outdated concepts and makes countless unsupported assertions, his rendering of world history is remarkable for its synoptic vision. It draws together a colossal body of facts into a framework for understanding central developments from the early period of the Common Era to the twentieth century. Furthermore, Needham never focuses just on individual states and regions but he places Chinese, Indian, Islamic, and Western achievements within the context of the reciprocal relations of Eurasian cultures.<sup>10</sup> Second, *Science and Civilisation* promises to be an influential work for a long time to come. Historians have scarcely begun to mine the rich material contained in those intimidating tomes arrayed on library shelves. For instance, the studies of alchemy, military technology, and agro-industry have not yet been incorporated into European, comparative, or world history. When they are, there should be some comprehension of the framework in which Needham intended to set them.

Third, *Science and Civilisation* already has had a significant impact on the writing of world history by virtue of Needham's discussion of the celebrated voyages (1405–33) of Zheng He of the Ming dynasty

<sup>9</sup> The final volume of *Science and Civilisation* now will include papers by several scholars, as well as four by Needham: "Science and Society in East and West," in *The Grand Titration: Science and Society in East and West* (London, 1969), pp. 193–204; "The Roles of Europe and China in the Evolution of Oecumenical Science," *The Advancement of Science* 24 (1967): 1–13 (also published in *Journal of Asian History*, 1 [1967]); with Ray Huang, "The Nature of Chinese Society—A Technical Interpretation," *Journal of Oriental Studies* 12 (1974): 1–16; "History and Human Values: A Chinese Perspective for World Science and Technology," *Philosophy and Social Action* 11 (1976): 1–33. Despite shifts of emphasis and reformulation of arguments, Needham's historical views remained remarkably consistent over decades. See Cohen, *The Scientific Revolution*, pp. 471–72.

<sup>10</sup> See SCC 5/2: xxii. This focus gives Needham common ground with other contemporary world historians. See William H. McNeill, *The Rise of the West: A History of the Human Community* (Chicago, 1963); Marshall G. S. Hodgson, *Rethinking World History: Essays on Europe, Islam, and World History*, ed. Edmund Burke III (Cambridge, 1993), pp. 3–28. For discussion and bibliography on cultural integration in world history, see Jerry H. Bentley, "Hemispheric Integration, 500–1500 C.E.," *Journal of World History* 9 (1998): 237–54.

(1368–1644) in the volume dealing with nautics.<sup>11</sup> Indeed, they are now renowned in the West precisely because Needham made them known to a wide audience for the first time. His dramatic contrast of these Ming expeditions with those of the Portuguese in the early sixteenth century captured the imagination of his readers. Rarely has a historical study been so widely applauded and universally accepted. It has been integrated into influential interpretations of world history, including works by Janet L. Abu-Lughod, Fernand Braudel, K. N. Chaudhuri, Pierre Chaunu, Alfred Crosby, André Gunder Frank, E. L. Jones, David S. Landes, William H. McNeill, J. M. Roberts, and Immanuel Wallerstein.<sup>12</sup> But the context which Needham establishes for the voyages and the part they play in his conception of world history remain unrecognized.

The convictions which impelled Needham to launch *Science and Civilisation* will be explored first, followed by an account of the historical questions which inspired him in the undertaking and a survey of his ideas on the nature of China and the West. The conclusion evaluates the influence of Needham's portrait of the voyages of Zheng He on the writing of world history and then considers the effects of Needham's approach to historical study on *Science and Civilisation*.

## A SPIRITUAL ANATOMY OF JOSEPH NEEDHAM

In 1973 a group of distinguished scholars honored Needham with a festschrift. The leading piece is a memoir by one Henry Holorenschaw, identified as the author of a book on the Levellers in the English Rev-

<sup>11</sup> SCC 4/3: 487–535; a brief preview of the Zheng He voyages is given in SCC 1: 143–44.

<sup>12</sup> Janet L. Abu-Lughod, *Before European Hegemony: The World System, A.D. 1250–1350* (Oxford, 1989), p. 322; Fernand Braudel, *Civilization and Capitalism, 15th–18th Century*, trans. Siân Reynolds, 3 vols. (New York, 1983), 2: 181; K. N. Chaudhuri, *Trade and Civilisation in the Indian Ocean: An Economic History from the Rise of Islam* (Cambridge, 1985), p. 61; Pierre Chaunu, *European Expansion in the Later Middle Ages*, trans. Katherine Bertram (Amsterdam, 1979), p. 217; Alfred Crosby, *Ecological Imperialism: The Biological Expansion of Europe, 900–1900* (Cambridge, 1986), p. 106; Andre Gunder Frank, *ReOrient: Global Economy in the Asian Age* (Berkeley and Los Angeles, 1998), pp. 99, 108, 121, 197; E. L. Jones, *The European Miracle: Environments, economies and geopolitics in the history of Europe and Asia* (Cambridge, 1981), 203–05; David S. Landes, *The Wealth and Poverty of Nations* (London, 1998), pp. 93–98; William H. McNeill, *The Pursuit of Power: Technology, Armed Force, and Society since A.D. 1000* (Chicago, 1982), pp. 42–49; J. M. Roberts, *History of the World*, rev. ed. (Oxford, 1992), pp. 363, 365; Immanuel Wallerstein, *The Modern World System: Capitalist Agriculture and the Origins of the European World-Economy* (New York, 1974), p. 54.

olution published over thirty years earlier. In terms of academic credentials, he was the least notable of the contributors, but he claimed to offer "a kind of spiritual anatomy" of Needham, an attempt to explain his apparent contradictions from the perspective of "one who knows him better than most people." In fact, the memoirist was Needham himself.<sup>13</sup> The subterfuge clearly was not intended to deceive the attentive reader, for a list of Needham's publications at the back of the volume identified Holorenschaw as his pseudonym. Still, however transparent, the artifice allowed Needham to say certain things which might have seemed self-regarding and even extravagant under his own name. At the same time, the essay is revealing about the passions which inspired Needham to write *Science and Civilisation* and which shaped its development and perspectives.

Joseph Needham of Cambridge, the author declares, seems to have been more free of cultural blind spots than most people. Convinced of the essential unity of all peoples, he has dedicated his life to breaking down cultural barriers and to proclaiming the lesson that "Wisdom was not born with Europeans." The religion, science, and philosophy of both East and West are embraced by him, "a single human being open by nature to all the forms of experience." His *Science and Civilisation* transcends conventional academic undertakings since it contributes toward the "great effort of mutual understanding and mutual explanation (which) is needed for the welfare and peace of the future world."<sup>14</sup> It expresses his conviction, a product of his Marxist and Christian beliefs, that the Kingdom of God "should be regarded as a realm of justice and comradeship on earth, to be brought about by the efforts of men throughout the centuries, not primarily as some mystical body existing already, or some spiritual state to be expected somewhere else in the future." He believes that the idea of human progress

<sup>13</sup> Henry Holorenschaw, "The Making of an Honorary Taoist," *Changing Perspectives in the History of Science: Essays in Honour of Joseph Needham*, ed. Mikulás Teich and Robert Young (Boston, 1973), p. 1; hereafter cited as Holorenschaw [Needham]. Needham's "Metamorphoses of Scepticism" in *Time, the Refreshing River*, 2nd ed. (London, 1986), pp. 7–27, written in 1941, contains some of the same information. Lu Gwei-Djen, Needham's long-time collaborator and second wife, wrote "The First Half-Life of Joseph Needham" (in *Explorations in the History of Science and Technology in China* [Shanghai, 1982], pp. 1–36), which repeats many of Holorenschaw's supposed reminiscences verbatim, interspersed with lengthy first-person accounts by Needham. Maurice Goldsmith's *Joseph Needham, 20th-Century Renaissance Man* (Paris, 1995) retails much of the information in Holorenschaw [Needham] and Lu, filled out with extensive interviews of Needham. Didier Gazagnadou's *Joseph Needham, un taoïste d'honneur: De l'embryologie à la civilisation chinoise* (Paris, 1991) is comprised of a French translation of the Holorenschaw [Needham] essay, followed by interviews of Needham.

<sup>14</sup> Holorenschaw [Needham], p. 19.

must be placed within the context of cosmological, organic, and social evolution, while the doctrines of historical materialism and class struggle are “perhaps recognition of the ways in which God has worked during the evolution of society.”<sup>15</sup>

Inasmuch as the making of *Science and Civilisation* represented “a quasi-religious vocation” for Needham, it is not surprising that he describes in providential terms “the great divide” in his life, his decision to turn toward the study of China.<sup>16</sup> In 1937 three Chinese biochemists came to Cambridge to study with Needham, and in conversations with them, he learned something firsthand about Chinese science and culture.<sup>17</sup> It struck him with a revelatory force comparable to that experienced by St. Paul on the road to Damascus: “It was as if he received from them some kind of liberation for which he had always been looking . . . something equal and opposite to all that in which he himself had been brought up, and something for that very reason of compelling fascination.”<sup>18</sup> Needham “completely ‘fell in love’ (as he himself says) with Chinese civilization, finding it of inestimable value not only for its own sake but in the critical appraisal of his own.”<sup>19</sup>

Needham immediately launched into study of the Chinese language, which was “a liberation like going for a swim on a hot day, for it got you entirely out of the prison of alphabetical words, and into the glittering crystalline world of ideographic characters.”<sup>20</sup> Within five years, he had abandoned research in biochemistry. While on the surface this appears to be an extraordinary change of direction, examination of Needham’s concerns before his 1937 revelation makes it clear that he had indeed found something “for which he had always been

<sup>15</sup> Ibid., p. 9. On the Kingdom of God as acceptance of “absolute equality and fraternity, and seeking justice everywhere for all human needs,” see Joseph Needham, “The Historian of Science as Ecumenical Man: A Meditation in the Shingon Temple of Kongosam-mai-in on Koyasan,” in *Chinese Science: Exploration of an Ancient Tradition*, ed. Shigeru Nakayama and Nathan Sivin (Cambridge, Mass., 1973), p. 8. Needham also states that “the Kingdom of God on Earth has all the authority of the evolutionary process behind it”; Needham, preface to *Time, the Refreshing River*, p. viii.

<sup>16</sup> Holorenschaw [Needham], pp. 11, 17.

<sup>17</sup> Needham, however, was predisposed to approve of China by virtue of the great influence on him of Karl A. Wittfogel’s *Wirtschaft und Gesellschaft Chinas* (1931), a Marxist interpretation of the Chinese imperial bureaucracy as arising from the provision of public works, such as canals and dikes, for the common good (see note 37 below). On Wittfogel’s influence, see Needham, “Science and Society in East and West,” pp. 193–95, 203–04. On Wittfogel and Needham, see Gregory Blue, “Joseph Needham, Heterodox Marxism, and the Social Background to Chinese Science,” *Science and Society* 62 (1998): 205–10.

<sup>18</sup> For the quotation, see Holorenschaw [Needham], p. 11. For the comparison with St. Paul, see Needham, *Science in Traditional China*, p. 3.

<sup>19</sup> Holorenschaw [Needham], p. 2.

<sup>20</sup> Quoted in Lu, “The First Half-Life of Joseph Needham,” p. 8.



looking." From an early age, he was interested in philosophy and comparative religion, and when he went up to Gonville and Caius College to read medicine, he had a good background in the study of classical history.<sup>21</sup> Publication of his three-volume *Chemical Embryology* (1931) at the age of thirty-one won him professional renown, with reviewers comparing it to Linnaeus' *Systema Naturae* and Darwin's *The Origin of Species*. Twelve years later, his *Biochemistry and Morphogenesis* pioneered the study of the formation and destruction of morphogenetic hormones.<sup>22</sup>

These were exceptional achievements for someone so near the start of his career. The Holorenschaw memoir reveals, however, the extent to which Needham struggled against the confines of his profession. As he saw it, "I tried to keep to my own field, but politics would keep breaking in."<sup>23</sup> The projects that most fully expressed his political enthusiasms and humanistic interests were unrelated to his work in the Cambridge Biochemical Laboratory, by-products of "evening reading or time for extraneous study snatched while waiting for the completion of a distillation or an incubation."<sup>24</sup> In *Man a Machine* (1927), an argument against teleology in scientific theory, he outlines the mathematical and materialistic basis for scientific discovery but concludes that "to the critical spirit, science is seen to be a dream," a way of viewing reality which demands integration with other, more pressing human concerns.<sup>25</sup>

In *A History of Embryology* (1934), a survey of the subject from the ancient world to the nineteenth century, he abandons his dry, academic tone in the conclusion and urges historians to turn their attention to the impact of capitalism on early modern science. Subjects such as the profits realized by embryologists in serving the absolutist courts of Europe need to be explored. Historians should, he proclaims, move beyond the realm of the ruling class to focus on the innovations and ideas of common people.<sup>26</sup> Two years later, Needham exemplified that injunction when he published an essay on the geographical distribu-

<sup>21</sup> Holorenschaw [Needham], p. 3. On Needham's lifelong association with Caius, see his interview upon retirement as Master of the College in the newsletter *Caian*, 19 June 1976, pp. 34-49.

<sup>22</sup> Lu, "The First Half-Life of Joseph Needham," p. 3.

<sup>23</sup> Needham, "Metamorphoses of Scepticism," p. 11.

<sup>24</sup> Holorenschaw [Needham], p. 7.

<sup>25</sup> Joseph Needham, *Man a Machine* (London, 1927), pp. 109-10. This work contains the germ of Needham's later condemnation of science in the West as alienating and exploitive. See also Needham, "History and Human Values," pp. 10-11; *The Great Amphibian* (New York, 1932), pp. 11-37.

<sup>26</sup> Joseph Needham, *A History of Embryology* (Cambridge, 1934), pp. 213-14. This work was originally the first portion of his *Chemical Embryology* (Cambridge, 1931, 3 vols.),

tion in England of ceremonial dance traditions since the Anglo-Saxon period, a work which applied the insights of evolutionary theory to the subject while also expressing the “democratic, socialist and populist elements in his composition which determined his lifelong political stance.”<sup>27</sup>

Since Needham’s political views were central to his next historical work, *The Levellers and the English Revolution* (1939), he published it under the pseudonym of Henry Holorenschaw. According to his own account, he was anxious at the time not to upset his colleagues at Caius College with his Marxist views.<sup>28</sup> In a curious reckoning of discretion, however, he contributed a preface to the book in his own name in which he asserted that it was in England “that men first saw the vision of the co-operative social commonwealth, where the iniquity of class should for ever be swept away.”<sup>29</sup> Needham’s intention was to show that communism was a native product, as English as ceremonial dancing and darts. He presents the Levellers as forerunners of the Russian Revolution, “inspired prophets of the co-operative social order.” Championing “the nationalization of the means of production,” the Leveller leader Gerard Winstanley preached ideas which are “reminiscent of the Soviet constitution today.” Needham discovered in the Levellers the same hopes for a “Kingdom of God on earth” that he would later find in Confucians and Daoists.<sup>30</sup>

Liberated by his exposure to Chinese culture in 1937, Needham first conceived of writing a book on Chinese science and technology in 1942, after completing *Biochemistry and Morphogenesis* and before leav-

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which contains no such appeal for economic and social research. That call was inspired by Needham’s exposure to Marxist approaches to the history of science at a conference of Soviet scholars in London in 1931. See Needham’s Foreword to the reprinting of *Science at the Cross Roads: Papers Presented to the International Congress of the History of Science and Technology*, 2nd ed. (London, 1971), pp. vii–x; P. G. Werskey, “On the Reception of Science at the Cross Roads in England,” *Science at the Cross Roads*, p. xxii.

<sup>27</sup> Joseph Needham, “The Geographical Distribution of English Ceremonial Dance Traditions,” *Journal of the English Folk Dance and Song Society* 3 (1936): 1–45. For the quotation, see Lu, “The First Half-Life of Joseph Needham,” p. 25. Those elements, however, were expressed in the actual writing of the essay, as well as in Needham’s enthusiastic participation in Morris dancing with laborers, and were not made explicit in the essay itself.

<sup>28</sup> Gary Werksey, *The Visible College: A Collective Biography of British Scientists and Socialists in the 1930s* (London, 1978), p. 169. On Needham’s sense of isolation at Cambridge University in the 1930s, see *Caian*, p. 43.

<sup>29</sup> Henry Holorenschaw [Joseph Needham], *The Levellers and the English Revolution* (London, 1939), p. 6.

<sup>30</sup> *Ibid.*, pp. 29, 94. On the Levellers and the Russian Revolution, see *idem*, pp. 13, 30, 35, 39. On links between science and socialism in the seventeenth century, see Needham, “Laud, the Levellers, and the Virtuosi,” *Time, the Refreshing River*, pp. 75–91. On the “Kingdom” in Confucian and Daoist aspirations, see Joseph Needham, “The Past in China’s Present,” *Within the Four Seas: The Dialogue of East and West* (London, 1969), pp. 63–64.

ing for China.<sup>31</sup> As a result of the four years which he spent there, however, the People's Republic replaced the Soviet Union as his model for "the co-operative social commonwealth," and Mao Zedong rather than Stalin became his political paragon.<sup>32</sup> Far more than the rigid, rule-bound Soviet Union, Mao's China appealed to Needham's romantic and utopian brand of Marxism. As Needham declared upon the death of Mao in 1976: "If Plato's idea that philosophers ought to be kings were ever to be implemented, there would be much to be said for regarding Mao Zedong as a phenomenon answering to Plato's idea."<sup>33</sup> Ten years later, Needham asserted that in bringing the Chinese people "out of the desert into the promised land," Mao followed in the line of prophets such as Moses and Marx.<sup>34</sup> As Needham saw it, the "mighty leap" of Chinese communism past the miseries of European industrialization represents a movement of enormous historical significance, "and the more Occidental peoples oppose it, the worse will be the judgment of world history on them."<sup>35</sup>

China under Mao and the Communist Party seemed to confirm notions which Needham had cherished for years—the truths of Marxism, the excellence of communal endeavor, the social responsibility of science, and the prospect of establishing a realm of justice and comradeship on earth. According to Needham, Mao acclimatized Marxism to ancient Chinese traditions which despised monetary incentives and promoted cooperative altruism at all ranks of society.<sup>36</sup> The notion of an essential continuity of spirit and social impulse between imperial China and the People's Republic was central to Needham's conception of the world-historical role of China. It also served, in Needham's eyes, to give his labors on *Science and Civilisation* a singular relevance to contemporary events.

<sup>31</sup> Holorenschaw [Needham], p. 13.

<sup>32</sup> On being asked if he would identify himself as a Maoist, Needham replied, "Yes, I certainly think so in some sense," adding that he regarded Maoism as "some kind of new form of religion as well as a political system" (*Caian*, p. 47).

<sup>33</sup> Joseph Needham, "On the death of Mao," *The New Scientist*, 71 (September 1976): 584. On Needham's stay in China, which was spent mainly in Nationalist-controlled regions, see SCC 1: 10–11; *Science Outpost: Papers of the Sino-British Co-operation Office (British Council Scientific Office in China, 1942–1946)*, ed. Joseph Needham and Dorothy Needham (London, 1948). Mao himself became increasingly utopian and visionary as he moved from the First Five-Year Plan (1953–57) to the Great Leap Forward (1958–60) and finally to the Cultural Revolution (1966–68); Maurice Meisner, *Marxism, Maoism and Utopianism* (Madison, 1982), pp. 187–94.

<sup>34</sup> Needham, preface to *Time, the Refreshing River*, p. vii.

<sup>35</sup> Joseph Needham, "The Dialogue between Asia and Europe," in *The Glass Curtain between Asia and Europe*, ed. Raghavan Iyer (London, 1965), p. 295.

<sup>36</sup> Needham, "On the death of Mao."

Needham read Marx and Engels in the 1920s and supported left-wing causes, but he never joined the Communist Party. An idiosyncratic Marxist, he did not feel obliged to follow Stalinist orthodoxy. When the Soviet Union condemned Karl A. Wittfogel's *Oriental Despotism* (1957) and its Marxist speculation about an "Asiatic Mode of Production," Needham continued to extol the basic thesis and to apply it to China.<sup>37</sup> In general, like many fellow travelers in Great Britain, Needham accepted certain simplified aspects of Marxism insofar as they validated his own rejection of Western capitalist society. Along with other Marxist scientists, such as J. B. S. Haldane and J. D. Bernal, he believed that historical and scientific research should be used to promote a "United Front" of progressive intellectuals against international fascism.<sup>38</sup> Needham's views were set very early, well before he became interested in China, and there is no indication that he ever changed them. Conversion to the study of China evidently did not shape his beliefs but rather expressed and substantiated his preconceptions.

What made Needham stand out as a Marxist was his highly personal amalgam of Marxism with Christianity, embryological models, evolutionary theory, and traditional Chinese philosophy.<sup>39</sup> A devout Anglican, Needham believed that the liturgy of the church "typifies the trend of all evolution and all history" toward communal institutions and communist morality.<sup>40</sup> Just as individual cells join to form more advanced organisms and embryos contain natural patterns which press toward realization, so too the peoples of the world are destined to unite in a communist society, the "World Co-operative Commonwealth to come."<sup>41</sup> He perceived similarities between his theory of social progress and the philosophies of Alfred North Whitehead and

<sup>37</sup> When Wittfogel turned against communism and converted his argument in *Wirtschaft und Gesellschaft Chinas* (see note 17 above) into an attack on totalitarianism in the Soviet Union and China in *Oriental Despotism: A Comparative Study of Total Power* (New Haven, 1957), Needham rejected the new interpretation and retained the positive focus of the earlier work. Probably because of his disenchantment over *Oriental Despotism*, Wittfogel's works are very infrequently cited in *Science and Civilisation*; see Colin Mackerras, *Western Images of China* (Oxford, 1989), p. 131.

<sup>38</sup> See John Callaghan, *Socialism in Britain since 1884* (Oxford, 1990), pp. 126–27; David Caute, *The Fellow-Travelers* (London, 1973), pp. 227–28.

<sup>39</sup> See Shigeru Nakayama, "Joseph Needham, Organic Philosopher," in *Chinese Science: Exploration of an Ancient Tradition*, pp. 30–42.

<sup>40</sup> The quotation is from an interview with Needham in Goldsmith, *Joseph Needham*, p. 56; see also pp. 64–65, 123–25.

<sup>41</sup> Needham, "On Science and Social Change," *The Grand Titration*, p. 124; "Integrative Levels: A Revaluation of the Idea of Progress," *Time, the Refreshing River*, pp. 233–72; *Biochemistry and Morphogenesis*, pp. xiv–xv, 677.

Pierre Teilhard de Chardin, both of whom regarded evolution as striving for greater complexity and harmony from primitive organisms to the highest forms of life.<sup>42</sup>

Needham believed that the two thinkers shared his notions of dialectical materialism. Indeed, he invariably discerned that Marxist schema in everything of which he approved. He applauded the attempts of Soviet scientists in the 1930s to apply its concepts to biochemistry.<sup>43</sup> He argued that the theory of evolution should move beyond a Darwinian view of the survival of the fittest by appropriating the dialectical notion of previously existing internal contradictions.<sup>44</sup> He saw the same principles at work throughout history, as in the American Revolution, when the ruling establishment (thesis) came into opposition with "the forces of the left" (antithesis), such as Daniel Shays, and gave birth to "gentry capitalism" (synthesis).<sup>45</sup> Even Providence manifested itself through dialectical laws, for "the historical process is the organizer of the City of God."<sup>46</sup>

Maintaining that "organic materialism" is the *philosophia perennis* of China, Needham enlisted Neo-Confucians and Daoists into the ranks of dialectical materialists. In Needham's account, Daoists had developed the idea of an organic concept of nature and a sense of dialectical movement toward unity in the third century B.C.E. and Neo-Confucians had systematized it in the twelfth century C.E.<sup>47</sup> These ideas

<sup>42</sup> Holorenschaw [Needham], pp. 9–10; Joseph Needham, "China and the West," in *China and the West: Mankind Evolving* (New York, 1970), p. 33; "On Science and Social Change," p. 124. Whitehead particularly influenced Needham when they were both at Cambridge in the 1930s. See Joseph Needham, "A Biologist's View of Whitehead's Philosophy," in *Time, the Refreshing River*, pp. 180–85. On Whitehead's influence in *Science and Civilisation*, see 2: 291, 498, 505, 562, 568, 580; 3: 151. Needham met Teilhard de Chardin in Paris after World War II, where Needham was serving as the first Assistant Director-General (1946–48) for the Natural Sciences in UNESCO; Lu, "The First Half-Life of Joseph Needham," pp. 1, 34. On Needham's sympathy for Teilhard de Chardin's ideas on cultural evolution and the emergence of the "cosmic Christ," see *Caian*, p. 46.

<sup>43</sup> Joseph Needham, *Order and Life* (London, 1936), pp. 44–46. On Needham's view of the limited uses of dialectical materialism in scientific research, see Blue, "Joseph Needham, Heterodox Marxism and the Social Background to Chinese Science," p. 200.

<sup>44</sup> Joseph Needham, "The Gist of Evolution," in *History is on Our Side* (London, 1946), pp. 123–24.

<sup>45</sup> Needham, "On Science and Social Change," pp. 127, 132.

<sup>46</sup> Needham, "Metamorphoses of Scepticism," p. 16.

<sup>47</sup> SCC 2: 76–77, 496, 504–505; Needham, *Order and Life*, pp. 9, 45–47; "The Past in China's Present," pp. 27, 66–68, 94–95. While Needham for various reasons somewhat identified with Daoists and Confucians, he generally lacked sympathy for Buddhists because of their notion of an afterlife determined by ethical conduct: Confucians "would have called it (if they had thought of the expression) the opium of the people"; SCC 5/2: 111. According to Needham, Winstanley anticipated "the criticism of religion as the opium of the people"; Holorenschaw [Needham], *The Levellers and the English Revolution*, p. 23.

subsequently traveled to Europe from Beijing in Jesuit reports in the seventeenth century and took root in Western philosophy. Thus Mao and other Chinese intellectuals in the twentieth century readily embraced Marxist dialectical materialism largely because they recognized it as part of their own intellectual heritage.<sup>48</sup>

In Needham's perspective, two figures played crucial roles in the transmission of Chinese scientific thought to Europe: Gottfried Wilhelm Leibniz (1646–1716) near the beginning of intellectual contact between East and West, and himself in an era of renewed cultural interaction. Leibniz performed the all-important function in the history of philosophy of a “bridge builder” between cultures. Aspiring to heal “the split personality of Europe,” as manifest in the struggle between scholastic vitalism and Newtonian mechanical materialism, Leibniz looked toward China.<sup>49</sup> He corresponded with the Beijing Jesuits and studied ideographic script, the *I Ching*, and Neo-Confucian philosophy. He introduced Neo-Confucian dialectical materialism to Western thought, a legacy which thereafter was passed on to Herder, Schilling, Hegel, Marx, and Whitehead.<sup>50</sup>

And, of course, to Needham, who self-consciously took up the Leibnizian program of bringing “the wider wisdom of Chinese organic humanism” to Europe and the world. He believed that Western civilization in his own time needed liberation from its spurious sense of cultural superiority, from a scientific mentality still dominated by Newtonian materialism, and from a rapacious technology driven by capitalist avarice.<sup>51</sup> His notion of the world-historical roles of China and Europe is an updated version of Leibniz's conviction that the location of the two civilizations at the extremes of Eurasia was a providential sign that eventually they would join in a vital cultural fusion.<sup>52</sup> Needham has his pseudonymous spokesman in the Holorenschaw memoir suggest that he was virtually destined for the task of cultural mediation

<sup>48</sup> SCC 2: 291–92, 298, 458; “The Past in China's Present,” p. 71; “On the death of Mao.”

<sup>49</sup> SCC 2: 498.

<sup>50</sup> Ibid., 2: 291–92, 496–48; 3: 157–58. On Leibniz's denial that Neo-Confucians were materialists, however, see Donald F. Lach, *The Preface to Leibniz' Novissima Sinica* (Honolulu, 1957), p. 64. For criticism of Needham's view of the influence of Neo-Confucianism on Leibniz, see David E. Mungello, *Leibniz and Confucianism: The Search for Accord* (Honolulu, 1977), p. 15. On the limited influence of Leibniz's view of China on European thought, see Knud Lundbaek, “Notes sur l'image du Néo-Confucianisme dans la littérature européenne du XVIIe à la fin du XIXe siècle,” *Actes du IIIe colloque international de sinologie* (Paris, 1983), p. 147.

<sup>51</sup> SCC 2: 339–40, 505; Needham, “History and Human Values,” pp. 10–12.

<sup>52</sup> Gottfried Wilhelm Leibniz, “Vorwort zu *Novissima Sinica*,” *Deutsche Denker über China*, ed. Adrian Hsia (Frankfurt, 1985), p. 11.

and synthesis inasmuch he was raised "in the midst of a battlefield" between a scientific father and an artistic mother. As a result, his mind from early in life was set "in a posture of permanent bridge-building, searching always as it were for the union of things separated, of science and religion, of biochemistry and morphology, of religion and socialism, and of East and West." Both personal imperatives and "the primacy of politics, (which) was a powerful Marxist element in his thinking," inspired him to unite conflicting forms.<sup>53</sup> He thus dedicated his life to ensuring that the achievements of China would be recognized and celebrated with "the joined hands of universal brotherhood."<sup>54</sup>

In Needham's eyes, then, *Science and Civilisation* did far more than merely rescue an important corpus of knowledge from the dust heap of history. The project flowed from the deepest wellsprings of his character and convictions. It embodied his aspirations for the synthesis of Eastern and Western cultures. It represented scholarship in the service of political reform and social evolution, a step toward the Kingdom of God on earth.

### THE GREAT QUESTIONS OF JOSEPH NEEDHAM

On returning to Cambridge in 1948, Needham intended to write a book of some 700 pages on Chinese science and technology. Never one to think on a modest scale, however, he soon envisaged seven volumes in fifty sections on all aspects of the subject from its origins until commencement of the fusion (as he saw it) of Chinese and European science around 1600.<sup>55</sup> From the appearance of the first book in 1954, the extraordinary dimensions of his enterprise became clear. Volumes multiplied as research progressed, as if the work was "enlarging according to some form of geometrical progression or along some exponential curve."<sup>56</sup> The breaking point apparently was the fourth volume (part three) on civil engineering and nautics. Perhaps the most widely consulted text in the series, it is an unwieldy 907 pages in length. The next subject, chemistry and chemical technology, hived itself off into no less than eight separately published sections averaging a mere 584 pages each.

<sup>53</sup> Holorenschaw [Needham], pp. 2–3, 6; see also Needham, preface to *Time, the Refreshing River*, p. v.

<sup>54</sup> These are the concluding words of Needham's prefatory discussion to the first volume of *Science and Civilisation* (1: 9).

<sup>55</sup> On the fusion of sciences, see Needham, "The Evolution of Oecumenical Science"; SCC 1: 149.

<sup>56</sup> SCC 5/2: xvii.

Inflation of the individual volumes and of the entire series resulted in part from incorporation of new material that came to hand as work progressed.<sup>57</sup> But Needham's sense of history also drove the expansion of the project. He believed that everything which influenced the development of Chinese science had to be considered: social structure, economics, religion, language, philosophy, law, medicine, occult practices, and Confucian ideology. Above all, Chinese science and technology needed to be placed within the context of comparative and world history. This was crucial since *Science and Civilisation*, at least in its early stages, addressed what Needham considered the relative failure of Chinese civilization.<sup>58</sup> China had impressive intellectual traditions, a secular public culture, scientific curiosity, and substantial technological skill—yet it failed to make the breakthrough to experimental and mathematical science and hence to the Industrial Revolution.<sup>59</sup> As Needham wrote in 1960, "Behind this question of why the rise of modern science took place only in Europe, and did not occur in East Asian civilization in spite of so many great Chinese achievements in the past in the scientific, mathematical, and technological field, lie all the problems of the nature and development of Chinese society."<sup>60</sup>

*Science and Civilisation* was dedicated to answering this "Great Question" from the beginning.<sup>61</sup> The inescapable fact of the Rise of the West hangs like a shadow over the enormous achievements detailed in the early volumes. Needham seems to have felt that if he could show the priority of the Far East over Europe in case after case of innovation—cast iron, canal lock gates, drawlooms, porcelain, piston billows, deep drilling, the suspension bridge, chain pumps, printing, paper, the crossbow, the wheelbarrow, the rotary fan: Chinese

<sup>57</sup> On expansion of the project, see the comments by Needham in Gazagnadou, *Joseph Needham*, pp. 89–90; SCC 5/2: xvii–xviii.

<sup>58</sup> See A. C. Graham, "China, Europe, and the Origins of Modern Science: Needham's *The Grand Titration*," *Chinese Science: Exploration of an Ancient Tradition*, pp. 45–48; Cohen, *The Scientific Revolution*, pp. 456–57.

<sup>59</sup> Needham assumed that there was a significant connection between the Scientific Revolution and the origins of the Industrial Revolution. For debate on the subject, see Neil McKendrick, "The Role of Science in the Industrial Revolution: A study of Josiah Wedgwood as a scientist and industrial chemist," in *Changing Perspectives in the History of Science*, pp. 274–319; David S. Landes, *Unbound Prometheus: Technological Change and Industrial Development in Western Europe from 1750 to the Present* (Cambridge, 1969), pp. 108–14.

<sup>60</sup> Needham, "The Past in China's Present," p. 83.

<sup>61</sup> The term first was applied to Needham's inquiry by Lynn White Jr., in the review symposium on *Science and Civilisation* in *Isis*. It subsequently was adopted by Needham; Cohen, *The Scientific Revolution*, p. 588 note 5. Needham refers to the issue of the relationship between the rise of modern science and socio-economic circumstances as "the Great Debate of the history of sciences" (SCC 3: 167); it also has been called "the Needham problem"; see Blue, "Science(s), Civilisation(s), Historie(s)," p. 38.



inventions “which poured into Europe in a continuous stream during the first thirteen centuries of the Christian era”—then he could assuage the fate which had befallen Chinese civilization and the rest of the non-Western world.<sup>62</sup>

Expansion of *Science and Civilisation*, however, led Needham to redefine the problem with which he began, that is, “Why did modern science begin in the West and not in China?” Around ten years and five volumes into the series, he shifted to what one may call another Great Question: “Why was Chinese civilisation much more efficient than occidental in applying human natural knowledge to practical human needs?”<sup>63</sup> Of course, this change of focus begged the question inasmuch as Needham had demonstrated no such thing. But it resolved a problem inherent in the growth of his study: the seventh and final volume of the series was to deal with the environmental, social, and political bases for the Scientific Revolution developing in the West and not in China.<sup>64</sup> At the rate of production of *Science and Civilisation*—somewhat more than three years for each text in the series—it seemed clear to Needham as he approached the age of seventy that he was unlikely to be alive to complete the final volume in some twenty years.<sup>65</sup> Redefining the question to be answered in terms of Chinese accomplishments per se rather than Chinese failure vis-à-vis the West meant that the response was available in work already done, both in the volumes of *Science and Civilisation* and in the many papers which Needham produced in tandem with the latter.

Other considerations probably also affected Needham's attitude towards the final volume. When he was urged in the late 1950s to clarify his thoughts on the origins of science in the West before producing additional volumes on Chinese achievements, he replied that he was reluctant to state publicly his relationship with Marxism. He was troubled that the first volumes of his project had been dismissed by some critics as dominated by Marxist theory and therefore unhistorical.<sup>66</sup> He perhaps came to believe that to climax the series with an exposition on

<sup>62</sup> For the quotation, see SCC 1: 239. The list is drawn from Needham's initial table of thirty-two mechanical techniques that he believes were transmitted from China to the West. He counterposes this with a table of four techniques (the screw, force pumps for liquids, the crankshaft, and clockwork) that supposedly went in the opposite direction; SCC 1: 242–43.

<sup>63</sup> Needham, “Science and Society in East and West,” p. 190; “History and Human Values,” p. 2; *Science in Traditional China*, p. 3.

<sup>64</sup> SCC 1: 19.

<sup>65</sup> Needham, “Science and Society in East and West,” p. 190.

<sup>66</sup> See Blue, “Joseph Needham, Heterodox Marxism, and the Social Background to Chinese Science,” pp. 196, 198–99.

world history dominated by a Marxist (and Maoist) perspective might discredit his life's work in many eyes. Moreover, Needham clearly did not feel compelled to spell out his political beliefs. He apparently thought that the attainments of Chinese civilization as he detailed them would make the case for imperial China as an exemplary system, a model in some respects for the future communist state, far better than any proclamations on his part. On a far smaller scale, he had been highly circumspect in earlier works, keeping his Marxist views out of his essay on English dance traditions and publishing his Marxist interpretation of the Levellers under a pseudonym. His writing of *Science and Civilisation* followed the same pattern, with his political ideology conspicuous only in occasional asides, such as invocation of "the joined hands of universal brotherhood," appeals for "universal social and international justice," and commendation of Mao as epitomizing ancient Chinese wisdom in his policies and public performances.<sup>67</sup>

Whatever the motivation behind Needham's reworking of the Great Question of *Science and Civilisation*, it had a substantial impact upon his presentation of world history in two respects. First, by shifting his focus from the rise of experimental and mathematical science in Europe to the benevolent role of traditional science in China, Needham effectively converted his long-standing characterization of the differences between China and the West into an explanatory principle itself. Regarding the two civilizations as "almost a test-bench experiment" in antithetical values, he evidently considered that by simply spelling out their supposed differences, he revealed the essential nature of their development and relationship.<sup>68</sup>

Second, focusing on the contrasts and relations between China and the West provided Needham with what he considered a satisfactory answer to the question with which he began *Science and Civilisation*. In his view of world history, the rise of modern science in Europe

<sup>67</sup> See SCC 1: 9; 4/3: 251; 5/2: 113; 5/6: 79; 5/7: 18. Needham's desire for discretion also may have been influenced by reaction to his most notable public declaration, two years before the first volume of *Science and Civilisation*. He was severely criticized in 1952 for his imprudence and communist allegiance when he was a member of a Chinese-sponsored commission which issued a report accusing the United States, under the cloak of the United Nations, of employing germ warfare against China and Korea. Needham, however, never abandoned his convictions regarding American use of germ warfare: although he suffered a "storm of abuse," he always maintained that the report was "required reading" in the history of bacteriological warfare; Lu, "The First Half-Life of Joseph Needham," p. 36; Holorenshaw [Needham], p. 15. See also, at The Needham Research Institute, *Report of the International Scientific Commission for the Investigation of the Facts Concerning Bacterial Warfare in Korea and China* (Beijing, 1952).

<sup>68</sup> For the quotation, see Needham, "Science and Society in East and West," p. 190.

was not merely the outcome of developments within Western civilization but was a direct result of the diffusion of Chinese technology; hence, if China did not give birth to the Scientific Revolution, it at least was responsible for its conception. In other words, the transition to modernity sprang from the long-distance influence of China on the West. Even more significant, world history thereafter revolved around the impact of the West on Asia, as seen in the ascendancy of European imperialism and in an obstructed fusion of Western and Chinese science. For Needham, these remain obstacles that must be overcome, for the fate of the modern world, the construction of the *Regnum Dei*, the Kingdom of God on earth, necessarily hinges upon eventual synthesis between the dialectical principles embodied by China and the West.<sup>69</sup>

When Needham spelled out those principles in his essays, however, his polemical impulses obscured beliefs which were fundamental to him. Indeed, even the most fair-minded summary of his views must convey a strident and extreme perspective which is at odds with his more generous inclinations. As both a Marxist and a historian, he was committed to the idea that societies are products of social and economic forces, not mere embodiments of abstract values and fixed traditions.<sup>70</sup> Ecumenical in spirit and learning, he was not a cultural essentialist but instead endorsed the Confucian maxim that "within the four seas all men are brothers."<sup>71</sup> He consistently emphasizes that modern science and technology, born in the West, have universal, positive values for humankind. He was neither a simple-minded denouncer of the West nor an uncritical adulator of China. Although he deplores Europe as riven by contradictory values, he also acknowledges that its "creative tensions" helped give birth to modern science, and he praises the West's achievements in the investigation of nature and technology, even while condemning Western use of science for military ends.<sup>72</sup> After an account of Portuguese atrocities in the Indian Ocean, he pays tribute to "those Lusitanians who were truly great," open-minded observers of the East such as Tomé Pires, Sebastião Manrique, and Fernão Mendes Pinto.<sup>73</sup> He describes Henry of Portugal ("the Navigator," 1394–1460), the supposed architect of Portuguese exploration, as "a visionary

<sup>69</sup> On the modern age as a turning point in cultural synthesis and in creation of the earthly Kingdom of God, see Needham, "Laud, the Levellers, and the Virtuosi," p. 89.

<sup>70</sup> At times, however, Needham wondered whether significant contrasts between Chinese culture and that of Europe might be innate rather than due to different historical experiences. He concluded that "perhaps it is too soon to attempt an answer to these questions, yet it is well to raise them"; SCC 5/6: 99.

<sup>71</sup> Needham, "The Dialogue between Asia and Europe," p. 294.

<sup>72</sup> Needham, "The Past in China's Present," p. 70.

<sup>73</sup> SCC 4/3: 535.

imbued with a world-shaking idea," a prince who could learn from both common seafarers and cosmographers, an aristocrat who treated African slaves with compassion, a Christian crusader against Islam who remained chivalrous and "for ever an inspiring and lovable figure."<sup>74</sup>

Needham never grasped the opportunity to elaborate upon these nuanced perspectives. Instead, driven by a compulsion "to redress a balance, which in the past tilted over much too far on the other side," he exalted Chinese achievements and virtues and slighted Western ones.<sup>75</sup> Eager to counter what he presciently termed "Europocentrism," he castigated the "schizophrenia" of the West and neglected to analyze the sources of its "creative tensions."<sup>76</sup> He suggested that China exemplified the "feminine" qualities of equity and flexibility while the West embodied a "masculine" impulse toward rigidity and certainty.<sup>77</sup> Thus perhaps Europe had "an inbuilt penchant" for warfare as opposed to China's "in-built co-operation";<sup>78</sup> "the built-in instability of European society must . . . be contrasted with a homeostatic equilibrium in China. . . ."<sup>79</sup> Formulations such as these permeate Needham's works, however alien to his scientific training, universalist perspective, and fundamental beliefs. He had a deep commitment to a common global humanity and to a detailed exploration of specific historical and social variation; but both effectively were put aside in the service of delineating what he regarded as the contrasting principles of China and the West, the synthesis of which would help usher in a better world for all humankind. He clearly believed that significant differences between cultures, whether they were intrinsic to societies or the consequence of social and economic forces, would vanish with "the coming of the world co-operative commonwealth which will include all peoples as the waters cover the seas."<sup>80</sup>

<sup>74</sup> SCC 4/3: 503–04, 535. Needham shared a traditional, mythic view of Prince Henry. For recent revisions, see Filipe Fernandez-Armesto, *Before Columbus: Exploration and Colonisation from the Mediterranean to the Atlantic, 1229–1492* (London, 1987), pp. 185–92; Malyn Newitt, "Prince Henry and the Origins of Portuguese Expansion," in *The First Portuguese Colonial Empire*, ed. Malyn Newitt (Exeter, 1986), pp. 9–35; Ivana Elbl, "Man of His Time (and Peers): A New Look at Henry the Navigator," *Luso-Brazilian Review* 28 (1991): 73–89.

<sup>75</sup> Needham, *Science in Traditional China*, p. ix. Needham's statement refers to his claims regarding the transmission of Chinese inventions to the West.

<sup>76</sup> In discussing Western traditions, Needham frequently uses "schizophrenia" as both a descriptive and disparaging term. He also refers to "schizophrenia" in the structure of fascist and capitalist society; Needham, "On Science and Social Change," p. 135.

<sup>77</sup> SCC 2: 531; Needham, "Human Law and the Laws of Nature," pp. 22–23, 32–34.

<sup>78</sup> SCC 5/6: 99; Needham, "On the death of Mao."

<sup>79</sup> Needham, "Science and Society in East and West," p. 214.

<sup>80</sup> Needham, "The Roles of Europe and China in the Evolution of Oecumenical Science," p. 13.

## THE DIALECTIC OF CHINA AND THE WEST

Governed by a Confucian civil service selected by an examination system, China has a more "rational" society than that of medieval Europe, which is dominated by a hereditary feudal elite and a military ethos.<sup>81</sup> Scientific investigation by Daoists is a "cumulative, disinterested cooperative enterprise" across many centuries.<sup>82</sup> Chinese humanitarianism and Confucian "human-heartedness" are a vital motivation behind improving communal life.<sup>83</sup> Public works for the common welfare—river control, irrigation, water power, encyclopedic publications, astronomical observatories, geomancy, iron casting, and pharmaceutical research—are sponsored by Confucian scholar-officials; but in the West, science is in thrall to private enterprise and used solely for monetary gain. Wealth is worshipped in Europe but has no "spiritual power" or prestige in China. Under Confucian tutelage, sometimes oppressive and always elitist, "bureaucratic feudalism" fosters an organic and harmonious society.<sup>84</sup> The values of merchants and warriors are subordinate to the aspirations of public-spirited, managerial specialists. Guided by "communal co-operativeness" and equity rather than by positive, codified law, China is a "highly constitutional empire" with a tradition of reciprocal altruism and "nationalized production." In the West, the law is imposed by magistrates with statute books, but in China it resides in the hearts of the populace.<sup>85</sup> As in a modern socialist society, the people of imperial China despise aristocratic and acquisitive values, and even merchants sponsor agencies of mutual aid and cooperation. "In a word, perhaps socialism was the spirit of undominating justice imprisoned within the shell of Chinese medieval bureaucracy."<sup>86</sup>

<sup>81</sup> In the following six paragraphs, the contrasts between China and the West are drawn from the essays by Needham listed in note 9 above (except for that written in collaboration with Ray Huang), as well as from Needham's "The Past in China's Present" and "The Dialogue of East and West," in *Within the Four Seas*, pp. 11–28. References to quotations, to *Science and Civilisation*, and to other works by Needham are provided. For ease of exposition, the contrast is cast in the present tense.

<sup>82</sup> Needham, *Science in Traditional China*, p. 120.

<sup>83</sup> SCC 6/1: 330.

<sup>84</sup> Needham, "Science and Society in East and West," pp. 202, 204, 213; SCC 3: 167. Needham points out that canals and roads are also used for enforcing state power; SCC 4/3: 225–26, 319.

<sup>85</sup> SCC, 2: 528, 530, 543; Joseph Needham, "Human Law and the Laws of Nature in China and the West," *Hobhouse Memorial Lecture* (London, 1952), p. 23; "The Past in China's Present," pp. 44, 66; "On Science and Social Change," p. 144. On the dominance in China of concrete ethical judgment rather than abstract legal codification, see SCC 2: 521–30.

<sup>86</sup> Needham, "Science and Society in East and West," p. 202.

It is a benign confinement, however, sanctioned by Confucian suppression of greed and militarism and by imperial provision of public services. In dealing with peasant society, Confucian officials follow a policy of “non-intervention,” allowing villages and clans to settle disputes among themselves. This is the political expression of a philosophy of restraint (or “action at a distance”) manifest in other spheres.<sup>87</sup> Daoist modes of scientific inquiry emphasize reflection on the world of nature rather than manipulation of it. Experiment upon nature is shunned since it would entail unacceptable violation of an organic order. Discerning the “universal ever-moving pattern” of reality is the Chinese fashion of maintaining harmony with it.<sup>88</sup> Unlike Westerners, the Chinese respect nature, hence (as in a socialist economy) they do not ravage it for profit.<sup>89</sup> Intellectual techniques such as Euclidean geometry and Aristotelian logic, which force nature into a Procrustean bed, do not arise in China, where the focus remains on concrete number (as in algebraic and calendrical calculation) and natural process (as in macrobiotics and magnetism).<sup>90</sup>

While the West may be said to display an “inbuilt penchant for warfare,” China maintains a pacifist tradition by virtue of its “built-in co-operativeness.”<sup>91</sup> Naturally, China experiences both civil war and nomadic attack from the north; but in ordinary times, its people practice a “non-military approach to war” and regard armed violence as the last resort in defense of communal peace. Soldiers show admirable concern for the general population and perform multiple public services for the civil bureaucracy. Confucian administrators maintain firm direction of the military, much as the Communist Party later controls the People’s Liberation Army.<sup>92</sup> The scholar-officials enforce and follow an austere moral code, animated by ideals of responsibility and communality, as well as by their devotion to ameliorating human exis-

<sup>87</sup> Thus in medicine, acupuncture is a noninvasive technique, in contrast to aggressive Western “antiseptic” methods of fighting disease; Needham, *Science in Traditional China*, p. 95.

<sup>88</sup> SCC 2: 580; see *idem*, 3: 167; Needham, “Science and Society in East and West,” p. 202. Needham, however, also states that Daoists later were echoed by Roger Bacon (d. 1292) and Francis Bacon (d. 1626) in their fantasies of power over nature through technology; SCC 4/2: 543; Needham, *Science in Traditional China*, p. 82.

<sup>89</sup> Needham, “History and Human Values,” pp. 23–24; SCC 4/3: 241–47. On architecture and perspective in landscape art as a reflection of Chinese and Western attitudes toward nature, see SCC 4/3: 61, 115.

<sup>90</sup> SCC 2: 76–77, 199–200, 576–78; 3: 150–68. On the construction of colossal public works in China without the use of Euclidean geometry, see *idem*, 4/3: 378.

<sup>91</sup> *Ibid.*, 5/6: 99; Needham, “On the death of Mao.”

<sup>92</sup> SCC 4/3: 223; 5/6: 72–77, 79.

tence, their aspiration to construct a "Kingdom of God on Earth."<sup>93</sup> Never in principle an autocrat, the emperor is "a cosmic figure" who fulfills the functions of both king and priest and vigilantly watches over the Confucian bureaucracy. His ritual plowing of a measured field at the vernal equinox, like Chairman Mao later toiling in a paddy field, represents the comradeship of government and people and testifies to the essentially democratic nature of Chinese society.<sup>94</sup>

According to Needham, the Far West is the polar opposite of China.<sup>95</sup> Whereas the latter is anti-commercial, anti-materialist, communalist, altruist, pacifist, ethical, in harmony with nature, and unified spiritually and politically, Europe is avaricious, competitive, individualist, absolutist, militarist, hypocritical, in conflict with nature, and divided against itself spiritually and politically. Because of the "sagely synthesis" which is the ideological force behind Confucian governance, China is rational, humane, flexible, tolerant, and dedicated to the common welfare.<sup>96</sup> Europe, however, is radically dysfunctional, suffering from a "split personality," "a schizophrenia of the soul," "a divided mind," "spiritual pride," irrationality, ambivalence, violence, and perpetual adolescence.<sup>97</sup>

The West is heir to a contradictory intellectual heritage: a Creator God and social righteousness from the Hebrews, sophistry and systematic philosophy from the Greeks, legal severity and authoritarianism from the Romans. These legacies result in, respectively, human alienation from a desacralized nature, an atomistic view of reality based on

<sup>93</sup> Needham, "The Past in China's Present," pp. 63–64; see SCC 5/2: 81–82, 111–13; "History and Human Values," pp. 11–12.

<sup>94</sup> Needham, "The Past in China's Present," pp. 42, 70; SCC 4/2: 477; see Needham and Huang, "The Nature of Chinese Society," p. 17. On the democratic nature of traditional China, see Needham, "On Science and Social Change," pp. 144–45, 148, 152. Needham distinguished between democracy as manifest in communal egalitarianism in China and as individualistic and representative, "with all its agitating activity," in the West; Needham, "Science and Society in Ancient China," *The Grand Titration*, p. 152. He saw Western-style democracy as perhaps necessary for a certain period of technological change in Europe but not as preferable in principle. On some "psychological connections" between democracy and science, see SCC 2: 130–32.

<sup>95</sup> This theme runs through all Needham's works but receives its most forceful expression in "The Dialogue between Asia and Europe," which is adapted from the 1955 essay, "The Dialogue between East and West."

<sup>96</sup> Needham, "The Past in China's Present," p. 70. On there perhaps being "less hypocrisy" in China than elsewhere, see *idem*, p. 50. On the Western emphasis on formal logic and litigation promoting hypocrisy, that is, casuistry and sophistry, see Needham, "History and Human Values," pp. 15, 20; "The Dialogue of East and West," p. 23. On the evils of Western individualism, see Needham, "Metamorphoses of Scepticism," p. 23. On Westerners as suffering from "the Four Evil Minds, greed, anger, foolish infatuation, and fear," see Needham, "The Historian of Science as Ecumenical Man," p. 5.

<sup>97</sup> SCC, 2: 302, 498; 5/2: xxiii–xxiv; 5/6: 99; Needham, "The Past in China's Present," pp. 69–70; "Science and China's Influence on the World," *The Grand Titration*, p. 122.

inordinate abstraction, and aristocratic oppression in the name of formal principles. Accommodation of Daoist and Confucian philosophies endows China with a kind of “natural wisdom” and stability; conflicting and extreme beliefs afflict Europe with “a certain heuristic naïveté” and restlessness.<sup>98</sup>

All three strands of their intellectual inheritance impel Westerners toward a “psychology of dominance” (or intervention) in science and society. So too does their background as shepherds and sailors, naturally accustomed to remorseless command and control, quite unlike the outlook cultivated in the cooperative agricultural environment of China. The “dominance psychology” of the West expresses itself in exploitation of nature, assumptions of cultural superiority, and political confrontation with others. It erupts in “diseases of upheaval,” such as crusading warfare, the Inquisition, autos-da-fé, witch hunts, and judicial trials of animals.<sup>99</sup> These are all unthinkable in China, as is the tumult which is an unrelenting feature of European life. The Far East has an all-pervading imperial bureaucracy but the West is an “essentially city-state civilisation.”<sup>100</sup> In the centuries during which China enjoys a “homeostatic equilibrium,” the West is plagued by “built-in instability”: contending republics in the ancient world and Middle Ages, conflict between pope and emperor, clashes of kingdoms, wars between princelings and barons. In the interstices of this political turmoil, merchants rise in influence, as heads of republics, bankers of monarchs, financiers of innovation, and capitalists on the make.<sup>101</sup> The radically competitive and aggressive behavior of warriors and traders keeps Europe stirred up and expedites its transition to a capitalist society, perhaps because a military orientation is so “illogical” that merchants find it relatively easy to substitute their own irrational values for warlike ones “when the time is ripe.”<sup>102</sup>

In Needham’s account, it is significant that the great edifice of imperial China remained unshaken by the inventions which revolutionized the West.<sup>103</sup> Political stability and Confucian dominance gave mercantile values no place in China, hence no alliance between cap-

<sup>98</sup> Needham, “The Past in China’s Present,” p. 62; SCC 2: 518, 564, 580.

<sup>99</sup> SCC 2: 574–78; Needham, “The Past in China’s Present,” p. 75; “Science and Society in East and West,” p. 211.

<sup>100</sup> SCC 4/3: 149; Needham and Huang, “The Nature of Chinese Society,” p. 14.

<sup>101</sup> Needham, *Science in Traditional China*, p. 121–23; “Science and Society in East and West,” p. 214; “The Past in China’s Present,” p. 55.

<sup>102</sup> SCC 5/6: 100. Needham notes that further discussion of this claim must await the final volume of *Science and Civilisation*. For similar caveats on this point, see Needham, “Science and Society in East and West,” p. 192; “Science and Society in Ancient China,” p. 186.

<sup>103</sup> SCC 5/7: 16–17.



italism and new modes of science was possible. Things proved to be different in the West as Chinese inventions coursed there in two great waves, at the end of the twelfth century (the compass, sternpost rudder, and windmill) and the end of the fourteenth (gunpowder, the mechanical clock, cast iron, the segmental arch bridge, and block printing).<sup>104</sup> These technologies were incorporated into a society tuned to novelty and enterprise by virtue of its intellectual fractures, political instability, and merchant class. This exacerbated a consideration which was intrinsic to the diffusion of invention: in journeying west, Chinese technologies abandoned their cocoon of Daoist principles and Confucian policy, the benevolent context in which they were nurtured and applied.<sup>105</sup> They were adopted in Europe as mere devices to dominate nature or political rivals: iron casting to make cannon, gunpowder to destroy feudal strongholds, mathematics for double-entry bookkeeping and ballistics, pumps for deeper mines, printed books for religious polemics and scientific debate, the compass and sternpost rudder for oceanic exploration.<sup>106</sup> Turmoil begat turmoil, for the inherent restlessness of their society made Europeans eager to wield the Chinese innovations, while incorporation of the foreign technology acted as a catalyst which generated yet more instability, strife, and ambition. Perpetually unsatisfied, Faust seized upon the instruments of China.<sup>107</sup>

Social and intellectual tensions in the West, coupled with the excessively rationalist outlook handed down from the Greeks, may have facilitated the emergence of the Scientific Revolution.<sup>108</sup> But Chinese inventions played an indispensable role, jump-starting the Western transition to modernity. According to Needham, the passage from feudalism to capitalism was made possible by gunpowder, the compass, paper, and printing.<sup>109</sup> Just as feudalism arose as a consequence of the Chinese foot stirrup, which created the armored knight on horseback, it collapsed when monarchs, financed by merchant-adventurers, shattered the castles of feudal aristocrats with cannon

<sup>104</sup> Ibid., 4/2: 544 note g.

<sup>105</sup> On the nature of technological diffusion, see *ibid.*, 1: 220–23.

<sup>106</sup> Ibid., 3: 166–68; Needham, “Science and China’s Influence on the World,” pp. 75–76.

<sup>107</sup> On the “Faustian soul” as a product of Western political diversity and economic necessity, see Needham, “Science and China’s Influence on the World,” pp. 121–22; see also Needham, *The Great Amphibian*, p. 172.

<sup>108</sup> Needham, “The Past in China’s Present,” pp. 70, 82; “Human Law and the Laws of Nature in China and the West,” p. 22; “Science and China’s Influence on the World,” p. 121.

<sup>109</sup> Needham, “On Science and Social Change,” p. 149.

fire.<sup>110</sup> With the death of feudalism, capitalism came into its own; the pace of change accelerated exponentially, outstripping the steady rate of progress in Confucian China. Freed from the restrictions of scholastic theology, science was revolutionized by the application of experiment and mathematics to nature. The rise of modern science and “early capitalist absolutism” went hand in hand.<sup>111</sup> By the fifteenth century, bourgeois entrepreneurs gained a leading role in the West, opening mines and foundries, dominating royal monopolies, building factories and shipyards, and financing discoveries in science and maritime exploration.<sup>112</sup>

According to Needham, Chinese inventions thrust the Far West ahead of other Eurasian civilizations, with both promising and terrible consequences. The impact of Chinese technology on Europe established the preconditions for a pivotal development in world history—the fusion of Chinese and Western science, which itself prefigures the emergence of the world cooperative commonwealth, the inevitable culmination of social evolution.<sup>113</sup> In the realm of science, Europe and China each had something to offer the other. On the one hand, Westerners had their new experimental and mathematical techniques, the basic methods of modern science. By virtue of their own scientific values, their self-denying ordinance not to intervene in nature, the Chinese themselves could not produce those tools. On the other hand, the excellence of Chinese science was such that it strained toward technologies and theories that demanded experiment and mathematics.

In Needham’s perspective, the paradox was that the West in the fifteenth century gained headway over the East by employing technologies that it did not invent, while China for many centuries had developed and applied “a theoretical science that did not exist.”<sup>114</sup> In the realm of technology, the “morphology” of the steam engine largely was

<sup>110</sup> On the foot-stirrup, Needham relies on the arguments of Lynn White Jr., *Medieval Technology and Social Change* (Oxford, 1962); see also SCC 4/2: 328 note f.

<sup>111</sup> While Needham treated the Scientific Revolution, the rise of capitalism, and the Protestant Reformation as what he called a “package deal,” he noted that explaining the actual connections required further investigation; Needham, Preface to *Time, the Refreshing River*, p. vi; “Science and Society in Ancient China,” p. 176; SCC 5/3: xxv. Needham had read Max Weber’s *The Protestant Ethic and the Spirit of Capitalism*, but he did not use it greatly in his discussions of this problem; Blue, “Joseph Needham, Heterodox Marxism and the Social Background to Chinese Science,” p. 213.

<sup>112</sup> SCC 3: 167–68; 5/6: 10, 16–17; Needham, “On Science and Social Change,” p. 149; *Science in Traditional China*, p. 122.

<sup>113</sup> On the creation of a community of cooperating scientists as the precursor of the world commonwealth, see Needham, “On Science and Social Change,” p. 139; “The Roles of Europe and China in the Evolution of Oecumenical Science,” p. 13. On the inevitability of a communist world state, see Needham, Preface to *Time, the Refreshing River*, p. v.

<sup>114</sup> Needham, “The Past in China’s Present,” p. 84.

discovered in China some 500 years before the time of James Watt (d. 1819);<sup>115</sup> the lineage of the internal combustion engine, as well as of gear transmission shafts, began, respectively, with Chinese bombards of the Song period (960–1279) and perfume lamps of the Han (206 B.C.E.–220 C.E.);<sup>116</sup> the precursors of the Wright brothers and modern aerodynamic notions were kites flown in the period of the Warring States (480–221 B.C.E.) and speculation on the dynamics of flight by Daoist adepts in the reign of the Eastern Jin (317–420);<sup>117</sup> and the logic of the modern computer can be traced back through Leibniz's binary arithmetic to Neo-Confucian study of divinatory symbols in the *I Ching*.<sup>118</sup> In the realm of theory, thirteenth-century Chinese investigation into the phenomena of magnetism helped "to achieve the great synthesis of Isaac Newton";<sup>119</sup> ancient Chinese research on elixirs of life represents the "ultimate source of all medical chemistry and chemotherapy";<sup>120</sup> the contending principles of Yin and Yang functioned as a sort of "prototypic wave theory";<sup>121</sup> the Daoist denial of the fixity of biological species came "very near to a statement of a theory of evolution";<sup>122</sup> Mohist reflections on conceptual model making in the third and fourth centuries B.C.E. were rediscovered and developed by James Clerk Maxwell, Erwin Schrödinger, and Ludwig Wittgenstein;<sup>123</sup> and Daoist appreciation of relativism and the immensity of the universe represents a "groping after an Einsteinian world-picture."<sup>124</sup>

Beyond these gifts to the world which would be realized through experiment and mathematics, Needham contends that the Chinese philosophy of the organism, the characteristic principle of East Asian civilization, is needed to fulfill the potential of Newtonian science. Just as Chinese technology was responsible for the conception of the Scientific Revolution, Chinese wisdom is necessary to bring the adolescent to maturity. Since mechanistic, instrumentally driven Western

<sup>115</sup> SCC 4/1: 69–70; 5/7: 545, 561–62; Needham, "History and Human Values," p. 4.

<sup>116</sup> SCC 5/7: 564.

<sup>117</sup> *Ibid.*, 4/2: 580–82, 592–93.

<sup>118</sup> *Ibid.*, 2: 340–45.

<sup>119</sup> Joseph Needham et al., *Clerks and Craftsmen in China and the West: Lectures and Addresses on the History of Science and Technology* (Cambridge, 1970), p. 5.

<sup>120</sup> Needham, "The Historian of Science as Ecumenical Man," p. 4; see also SCC 5/4: 503, 507–08.

<sup>121</sup> SCC 4/3: xlv; Needham, *Science in Traditional China*, pp. 11, 17, 20.

<sup>122</sup> SCC 2: 78.

<sup>123</sup> *Ibid.*, 2: 184.

<sup>124</sup> *Ibid.*, 2: 543. The language employed by Needham in most of these cases makes it difficult to tell whether he saw the respective Chinese achievement as directly contributing to a Western innovation, as making up part of a complex tradition which represents an essential background to the Western innovation, or as in some sense prefiguring part or the whole of the Western innovation.

science fails to grasp the holistic nature of reality, the principles of Chinese science—organic order, dialectical development, and reverence for nature—must augment it in order to perfect a comprehensive, humane worldview. Needham was certain that modern science will remain stunted and explosively dangerous unless it is informed by precepts and values which evolved within the exemplary context of traditional China.<sup>125</sup>

Needham laments, however, that the early promise of an “age of unified world science” was thwarted, even though an excellent start was made by Matteo Ricci (d. 1610) and his fellow Jesuits in Beijing. They came to grief as a result of the Rites Controversy, a debate over Jesuit incorporation of homage to Confucius and the sages of antiquity into Christian ritual. That was altogether too much cultural synthesis as far as the Roman papacy was concerned. Pope Clement XIV ordered the dismantling of the Jesuit mission to China in 1773, an action which “can be compared only with the gruesome story of the extinction of the Knights Templars earlier and the liquidation of the Old Bolsheviks later.”<sup>126</sup>

Although Leibniz had passed on something of Chinese thought to the West, Needham believes that it fell far short of what was needed for fundamental reformation of Western views. Another such opportunity for the creation of a “unified science” would not come until the later twentieth century, when Chinese scientific accomplishments and values would be presented fully to the West for the first time in *Science and Civilisation*. Indeed, Needham regards it as a historical tragedy that relations between the Far East and Far West were dominated for generations not by scholarly exchange but by avarice, inhumanity, and malevolence—Portuguese warships off the China coast in the sixteenth century, British steam-driven gunboats on the Yangzi River in the Opium War, and Western aggression against Korea and China in the 1950s.<sup>127</sup> The prospects of humankind trembled in the balance during these centuries: “How fortunate it was for the future cultural synthesis of the world that Chinese civilisation was never overcome

<sup>125</sup> Ibid., 2: 339–40, 504–505, 582; 4/3: 507 note d, 535 note b; 5/2: xxix; Needham, “Human Law and the Laws of Nature in China and the West,” p. 43; “History and Human Values,” pp. 10–12, 15–19, 21–24.

<sup>126</sup> SCC 5/3: 223; 465, 509. For criticism of Needham’s assertion that Chinese and Western science were fusing in the early seventeenth century, see Jonathan D. Spence, review symposium on *Science and Civilisation* in *Isis*, p. 82. On the Controversy, see J. S. Cummins, *A Question of Rites: Friar Domingo Navarrete and the Jesuits in China* (Aldershot, England, 1993); and the essays in *The Chinese Rites Controversy: Its History and Meaning*, ed. D. E. Mungello (San Francisco, 1994).

<sup>127</sup> On tragedy in history arising from misuse of science and technology, see SCC 5/7: 568. The list of Western assaults on the Far East comes from Needham’s “The Dialogue of

by European arms.”<sup>128</sup> In Needham’s view, it is a painful irony that such a possibility arose only after Europeans had pioneered a route to the East by using Asian innovations—the magnetic compass, stern-post rudder, multiple masts, and lateen sail—which had come into their predatory hands. The gunpowder technology of China then enabled them to enforce their will.<sup>129</sup>

For Needham, the voyages of Zheng He and Vasco da Gama in the fifteenth century reveal that when China and the West reached beyond their cultural borders, they did so as thesis and antithesis, the one promising peace and increase of knowledge, the other threatening the world with terrible consequences. The significance for Needham of this development in world history is indicated by the unique place that discussion of the voyages holds in the volumes of *Science and Civilisation*: It is the only occasion in which Needham steps back from dense discussions of topics such as cantilevers, crankshafts, and harness components to analyze historical actions at length and to contrast the performance of China and the West on the same historical stage.

The passage of the fleets of Zheng He and da Gama into the Indian Ocean, halfway between Nanjing and Lisbon, was a “confrontation that failed to occur,” a long-distance enactment of opposed values and historical trajectories.<sup>130</sup> Naturally, Needham’s contrast between the two sets of voyages recapitulates his general one between the West and China. Backed by “international finance,” driven by “insatiable thirst for gold” and “an obsessive desire for power,” the Portuguese engaged in total war in the Indian Ocean, rampaging on the high seas, aiming

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East and West” (p. 28), a lecture delivered to the Britain-China Friendship Association in 1955. When Needham revised the essay in 1965 (in “The Dialogue between Asia and Europe”), he deleted the list but added references to “a new fascism, carrying the banner of democracy,” to Korea “as the object lesson of what will remain of a country after it has been ‘liberated’ by modern means (of warfare),” and to the lamentable situation that United Nations headquarters is located in the United States (pp. 285, 292 note 1, 295).

<sup>128</sup> SCC 4/3: 535 note b; see also *idem*, 4/3: 507 note d.

<sup>129</sup> See Needham, “The Dialogue between Asia and Europe,” p. 287.

<sup>130</sup> Joseph Needham, “Abstract of material presented to the International Maritime Commission at Beirut,” in *Sociétés et compagnies de commerce en orient et dans l’océan indien* (Paris, 1970), p. 146. On the voyages, see SCC 4/3: 486–535. In the following discussion, the itineraries and technologies of the fleets as described by Needham are assumed. In addition to Needham’s account, see J. J. L. Duyvendak, “The true dates of the Chinese maritime expeditions in the early fifteenth century,” *T’oung Pao* 34 (1938): 341–412; J. V. G. Mills’s introduction to Ma Huan’s *Ying-Yai Sheng-Lan: The Overall Survey of the Ocean’s Shores* [1433], trans. and ed. Feng Ch’eng-chün (Cambridge, 1970), pp. 1–66. The first book in English on Zheng He is a nonscholarly narrative dependent on Needham; see Louise Levathes, *When China Ruled the Seas: The Treasure Fleet of the Dragon Throne, 1405–1433* (New York, 1994).

to destroy Eastern trade root-and-branch, and introducing "secret-police terror" to their colonial enclaves.<sup>131</sup>

Trade by the 300-odd junks of Zheng He "(though large) was incidental." In effect, the eunuch commanders of the Ming expeditions, as representatives of the imperial government, performed the same function overseas that the Confucian bureaucracy did at home: they "helped to restrain individual avarice and the crimes to which it could give rise."<sup>132</sup> While the feudal kingdom of Portugal established an empire of mercantile capital, Chinese bureaucratic feudalism produced "an empire without imperialism."<sup>133</sup> The 26,000 troops in the Ming fleet had "primarily ceremonial" duties inasmuch as they were part of "a navy paying friendly visits to foreign ports."<sup>134</sup> In dealing with religious groups, the Chinese displayed "almost excessive urbanity" and "an enlightened conception of inter-cultural contact." Indeed, the absence of religious bigotry and holy war in their culture represents "a feather in the cap of Chinese humanism."<sup>135</sup>

Needham acknowledges that the reasons for the Ming voyages were mixed—some tribute trade, a display of imperial grandeur, cultural contact, perhaps at first a search for the man deposed from the throne by the Yongle emperor (r. 1402–24).<sup>136</sup> But Needham regards the "proto-scientific" motive as most significant: "An increase in knowledge of the coasts and islands of the Chinese culture area was looked for, and the routes to the Far West were to be surveyed. Furthermore, the search for rarities of all kinds was to be actively prosecuted and gems, minerals, plants, animals, drugs, and the like were to be collected for the imperial cabinets."<sup>137</sup>

Needham claims that as the seven expeditions sailed out from 1405

<sup>131</sup> SCC 4/3: 514–15, 517, 522, 534.

<sup>132</sup> Ibid., 4/3: 517, 533. Needham asserts, without any evidence, that the demand for trade came mostly from "humble men of small means"; *idem*, 4/3: 517.

<sup>133</sup> Ibid., 4/3: 517–18.

<sup>134</sup> Ibid., 4/3: 489, 514. According to Needham, Zheng He's troops fought only in self-defense, as when they were attacked by two local chiefs in Sumatra and by the king of Ceylon; see *idem*, 4/3: 515–16.

<sup>135</sup> Ibid., 4/3: 522, 533 and note i.

<sup>136</sup> Yongle came to power in civil war against his nephew, the emperor Jianwen (r. 1398–1402). Rumor and legend had it that the emperor was not killed when his palace burned down in 1402 but instead fled overseas; David B. Chan, *The Usurpation of the Prince of Yen, 1398–1402* (San Francisco, 1976), pp. 204–205, 232. On the early Ming emperors, see Hok-lam Chan, "The Chien-wen, Yung-lo, Hung-hsi, and Hsuan-te reigns, 1399–1435," *The Cambridge History of China, vol. 7, part 1: The Ming Dynasty, 1368–1644*, ed. Frederick W. Mote and Denis Twitchett (Cambridge, 1988), pp. 182–304.

<sup>137</sup> SCC 4/3: 489. Needham's emphasis on the "proto-scientific" motives of the voyages is somewhat less pronounced in *Clerks and Craftsmen in China and the West*, p. 57.

to 1433, the collection of materials for scientific purposes grew more important and other motives dropped away. Merchants and military men were much less important in the fleets of Zheng He than were astronomers, geomancers, physicians, and naturalists searching for *materia medica*. The knowledge they gathered in their “urbane but systematic tour of inspection of the known world” went to swell the encyclopedias of the Ming dynasty. The scholars in the fleet carried on an old Chinese tradition of scientific curiosity about alien things, something that Westerners only discovered for themselves around a century later.<sup>138</sup>

So there we leave them—voyagers from the East, the Chinese, calm and pacific, unencumbered by a heritage of enmities; generous (up to a point), menacing no man’s livelihood; tolerant, if more than a shade patronizing; in panoply of arms, yet conquering no colonies and setting up no strongholds—voyagers from the West, the Portuguese, crusader-traders out to take hereditary enemies (in the Islamic Middle East) in the rear and wrest a mercantile foothold from unsympathetic soil; hostile to other faiths yet relatively free from racial prejudice; hot in the pursuit of economic power; and heralds of the Renaissance.<sup>139</sup>

#### JOSEPH NEEDHAM AND THE WRITING OF WORLD HISTORY

Needham brought uncommonly strong personal and political convictions to historical scholarship. Like Oswald Spengler (1880–1936) and Arnold J. Toynbee (1889–1975), his view of world history is permeated by a sense of prophetic destiny, the certainty that his historical study is linked with the evolution of humankind. All three historians focus on civilizations as units of analysis, compare those civilizations to living organisms, and mourn the flaws inherent in the nature of Western civilization.<sup>140</sup> Toynbee bears the closest resemblance to Needham: in his multivolume production, urge toward cultural synthesis, condemnation of soulless technology, contempt for individualism, predictions about world government, mixture of Christianity and communalism,

<sup>138</sup> SCC 4/3: 489, 492–93, 529–30.

<sup>139</sup> Ibid., 4/3: 535.

<sup>140</sup> See Oswald Spengler, *The Decline of the West*, trans. Charles Francis Atkinson, 2 vols. (New York, 1946); Paul Costello, *World Historians and their Goals: Twentieth-Century Answers to Modernism* (DeKalb, Illinois, 1993), pp. 46–69. For criticism of Spengler, see Needham, *The Great Amphibian*, pp. 136–37, 167; SCC 5/3: xxiii–xxiv.

and ambition to have his scholarship advance the consummation of history.<sup>141</sup>

But whereas Toynbee marshalled mountains of facts and a dictionary of concepts to argue his case, Needham left the readers of *Science and Civilisation* uninformed about his larger historical notions. He regarded the project as "his opportunity to preach [and I use the word advisedly] to his own and later generations."<sup>142</sup> His pronouncements there are subdued, however, delivered mainly in asides and undertones, footnotes and parentheses. His conception of world history appears only "in embryo," to use one of his favorite phrases.<sup>143</sup> Examination of Needham's portrait of the Ming voyages indicates the kind of problems that arise from this way of writing history.

Zheng He did not, as Needham suggests, inspire the Ming voyages, and there is no significant sense in which he can be regarded as an explorer.<sup>144</sup> He commanded the maritime expeditions as a military agent of the Yongle emperor, a ruler who had no interest in voyages of discovery. There is no mystery about the origin of the fleets, for the emperor ordered them when he came to the throne, and they ended precisely when he died.<sup>145</sup> Aggressive and ruthless, Yongle was one of the most militaristic rulers in Chinese history. Although he perhaps plowed a ritual measure at the vernal equinox, he was more accustomed to a sword in his hand. He came to power in a bloody civil war, commanded five campaigns against the Mongols, and sent an army of over 200,000 men to invade Vietnam.<sup>146</sup> The last venture began in

<sup>141</sup> See Arnold J. Toynbee, *A Study of History*, 12 vols. (London, 1948–61); William H. McNeill, *Arnold J. Toynbee: A Life* (New York, 1989). For criticism of Toynbee, see SCC 1: 241. For a comparison of Needham to Toynbee and James Frazer, see Derek J. De Solla Price, "Joseph Needham and the Science of China," *Chinese Science: Explorations of an Ancient Tradition*, pp. 9–10.

<sup>142</sup> See note 4.

<sup>143</sup> See SCC 2: 170; 5/3: 48. Metaphors drawn from physiology, morphology, and embryology are omnipresent in *Science and Civilisation*, especially regarding the development of technology; for some examples, see *idem*, 4/1: 69–70; 4/2: 227, 387; 4/3: 3, 34, 311–12; 5/3: 48.

<sup>144</sup> On Zheng He as the inspiration, see *ibid.*, 4/3: 487. In the same passage, Needham refers to Prince Henry as the inspiration behind Portuguese exploration to India. This view of Henry, however, is part of a myth which stems from the later fifteenth century. See note 74.

<sup>145</sup> The emperor Hongxi (r. 1424–25) canceled the voyages on the day he ascended the throne. The emperor Xuande (r. 1425–35) ordered the final voyage in 1431, apparently to take tribute envoys in China back to their native lands. See Edward Dreyer, *Early Ming China: A Political History, 1355–1435* (Stanford, 1982), p. 222.

<sup>146</sup> See Jung-pang Lo, "Intervention in Vietnam: A Case Study of the Foreign Policy of the Early Ming Government," *Tsing Hua Journal of Chinese Studies* 8 (1970): 154–82;



1406, the year after Zheng He's fleet first sailed to Southeast Asia. Yet the emperor does not figure in Needham's analysis.<sup>147</sup> This is rather like relating the voyage of the Spanish Armada without mentioning that the political ambitions of Philip II had a lot to do with it.

The 26,000 troops on board the Chinese junks were not a ceremonial cortege for diplomatic occasions, a task for which they would have been too grand and expensive a throng in any case. Rather, they were an expeditionary force for executing the emperor's will, whether that meant militarizing the tribute system, suppressing piracy in Southeast Asia, bringing overseas Chinese ports under control, or even making Siam and Java vassal states of the empire.<sup>148</sup> The voyages were not generally tranquil because the Chinese were "calm and pacific" but because the troops in the fleet were experienced, heavily armed, and greater in number than the entire population of most entrepôts between Nanjing and Mombasa.<sup>149</sup> Moreover, trade was not merely an incidental activity of the armadas, for Yongle evidently intended to harness the force (and profits) of seaborne commerce to serve the purposes of imperial hegemony in Southeast Asia.<sup>150</sup>

Naturally, historians differ over how to evaluate the extraordinary voyages of Zheng He. Ever since the Qing period (1644–1911), there has been controversy about all aspects of them, especially regarding their economic and political significance.<sup>151</sup> What is noteworthy is

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Dreyer, *Early Ming China*, pp. 171–82, 206–11. On the character of Yongle, see Wang Gungwu, "China and South-East Asia, 1402–1424," in *Studies in the Social History of China and South-East Asia: Essays in Memory of Victor Purcell*, ed. Jerome Ch'en and Nicholas Tarling (Cambridge, 1970), pp. 376–77.

<sup>147</sup> Needham quotes a 1767 history which mentions Yongle dispatching Zheng He (SCC 4/3: 487); he also refers to Yongle's tomb (4/3: 77 note c), the size of his navy (4/3: 484), and his death (4/3: 490, 525).

<sup>148</sup> See Wang, "China and South-East Asia, 1402–1424," pp. 375–401; Lo, "Intervention in Vietnam"; Robert Finlay, "The Treasure-Ships of Zheng He: Chinese Maritime Imperialism in the Age of Discovery," *Terrae Incognitae: The Journal for the History of Discoveries* 23 (1991): 1–12.

<sup>149</sup> On the population of port cities in Asia, see Tertius Chandler, *Four Thousand Years of Urban Growth: An Historical Census*, 2nd ed. (Lewiston, N.Y., 1987), pp. 358–411.

<sup>150</sup> On the commercial aspect of the voyages, see Jung-pang Lo, "Chinese Shipping and East-West Trade from the Tenth to the Fourteenth Century," in *Sociétés et compagnies de commerce en orient et dans l'océan indien*, pp. 167–76; T'ien Ju-Kang, "Chêng Ho's voyages and the distribution of pepper in China," *The Journal of the Royal Asiatic Society of Great Britain and Ireland* 2 (1981): 186–97; Bodo Wiethoff, *Die chinesische seeverbotspolitik und der private überseehandel von 1368 bis 1567* (Hamburg, 1963), pp. 52–57; Han Zhenhua, "Lun Zheng He xia xiyang de xinzhì" (On the nature of Zheng He's voyages to the Western Ocean), *Zhenghe yanjiu zilao xuanbian* (Selected essays on Zheng He), ed. Research Association of Chinese Navigational History (Beijing, 1985), pp. 308–31.

<sup>151</sup> See Huang Huizhen and Xue Jindu, "Zheng He yanjiu bashi nian" (Research on Zheng He for eighty years), *Zhenghe yanjiu zilao xuanbian*, pp. 1–19; Zheng Hesheng and

not Needham's position in this debate but that he ignores it altogether. By effectively dismissing the ambitions of the Chinese emperor, the commodities carried in the junks, and the army which marched ashore in every port, Needham seals off the Ming expeditions from the worlds of politics, commerce, and international relations. He thus constructs a scenario in which Zheng He performs as a halcyon explorer leading a scholarly enterprise, the polar opposite of the Western voyagers who would ravage the East within two generations.

Historians have found Needham's basic contrast between the Chinese and Portuguese voyages irresistible, largely because of its potential for dramatizing and symbolizing a crucial turning point in world history.<sup>152</sup> They have not, however, reproduced his emphasis on the proto-scientific character of Zheng He's fleets, perhaps because it is inherently implausible as well as not supported by adequate evidence. Nor have they taken up Needham's unsupported suggestion that the voyages were terminated because compassionate Confucians wanted the money spent on the ships to go instead for water conservation and grain projects for the needs of the peasantry.<sup>153</sup> Yet they generally have accepted his characterization of the Ming expeditions as "voyages of discovery," appropriately to be counterpoised with the Portuguese.<sup>154</sup> In the absence of any political, economic, or even proto-scientific context for the fleets of Zheng He, this has created a striking enigma. Fernand Braudel states that Ming maritime expansion "still remains in many respects a mystery," while Janet Abu-Lughod declares that historians despair of solving the riddle of why the voyages of Zheng He failed to lead on to world hegemony for China.<sup>155</sup> For Immanuel Wallerstein, "The origins of the expeditions and the cause of their cession

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Zheng Yijun, *Zheng He xia xiyang zilao huibian* (Collected sources on Zheng He's voyages), 2 vols. (Jinan, 1980), 2: 867–903.

<sup>152</sup> See above, note 12. The contrast has also made its way into textbooks, as in a McGraw-Hill publication designed as supplementary reading in world-history courses: Ken Wolf, *Personalities and Problems: Interpretive Essays in World Civilisations*, 2 vols. (New York, 1999), 2: 1–9.

<sup>153</sup> See SCC 4/3: 524–25.

<sup>154</sup> For the Chinese and Portuguese ventures as "voyages of discovery," see SCC 4/3: 487. Needham, however, is confusing on this point. He states that "the Chinese motive was never primarily geographical exploration" but rather "cultural contacts with foreign peoples"; *idem*, 4/3: 529. At the same time, he states that one of Zheng He's tasks was to survey "the routes to the Far West," and he argues in detail that Zheng He may have rounded the Cape of Good Hope and that other Chinese voyagers may have reached Australia and pre-Columbian America; *idem*, 4/3: 489, 494–503, 540–53.

<sup>155</sup> Braudel, *Civilization and Capitalism*, 3: 485–86; Abu-Lughod, *Before European Hegemony*, p. 321.

are equally unclear.”<sup>156</sup> Pierre Chaunu also follows Needham in considering Zheng He’s expeditions in parallel with those of European exploration; but he laments “the stark impossibility of knowing the reasons for the Chinese expansion or for the collective abandoning of the enterprise at the peak of success.”<sup>157</sup>

Historians are not commonly so morose about the prospect of illuminating significant events. Clearly, the source of their bewilderment is that since everyone knows that nothing deterred Columbus and da Gama from their epoch voyages of discovery, one cannot comprehend or appreciate what stopped Zheng He, their putative Chinese counterpart. Alfred Crosby hails him as “the first great figure of the age of exploration,” and O. H. K. Spate awards him the title of “Admiral of the Ocean Sea.”<sup>158</sup> E. L. Jones argues that while Columbus eventually won a sponsor among Europe’s rival monarchs for his voyage of discovery, Zheng He was summoned home from his exploration by commands from a monolithic empire.<sup>159</sup> William McNeill suggests that if the Chinese government had not had many other pressing concerns, “Chinese navigators might well have rounded Africa and discovered Europe before Prince Henry the Navigator died (in 1460).”<sup>160</sup>

This sort of speculation is useful inasmuch as it forces one to reexamine historical developments, to mentally bracket awareness of how things in fact turned out. Furthermore, world historians surely have been attracted to the Ming expeditions because they help correct Eurocentric assumptions about the inexorable triumph of the West.<sup>161</sup> The notion of Zheng He’s junks “sailing to Europe, brushing aside a few Portuguese caravels along the way, with world domination thereby falling to the lot of imperial China” raises the intriguing counterfactual possibility of the Rise of the East in world history.<sup>162</sup> The problem,

<sup>156</sup> Wallerstein, *The Modern World-System*, p. 54.

<sup>157</sup> Chaunu, *European Expansion in the Later Middle Ages*, p. 228 note 105.

<sup>158</sup> Crosby, *Ecological Imperialism*, p. 106; O. H. K. Spate, *The Spanish Lake* (Minneapolis, 1979), p. 145. For similar characterizations, see Frank Debenham, *Discovery and Exploration: An Atlas of Man’s Journey into the Unknown* (London, 1960), p. 121; Philip Snow, *The Star Raft: China’s Encounters with Africa* (London, 1988), p. 21; Qiu Kehui, “Zhouji hanghai de jiechu xianxingzhe Zheng He” (Zheng He, the distinguished forerunner of intercontinental navigation), *Zhenghe xia xiyang lunwenji* (Essays on Zheng He’s voyages), ed. Research Association of Chinese Navigational History (Beijing, 1985), pp. 36–46.

<sup>159</sup> Jones, *The European Miracle*, pp. 67, 203–204.

<sup>160</sup> McNeill, *The Pursuit of Power*, p. 45; see also his “World History and the Rise and Fall of the West,” *Journal of World History* 9 (1998): 229.

<sup>161</sup> See M. N. Pearson, “Merchants and States,” in *The Political Economy of Merchant Empires*, ed. James D. Tracy (Cambridge, 1991), p. 105.

<sup>162</sup> Robert Finlay, “Portuguese and Chinese Maritime Imperialism: Camões’s *Lusiads* and Luo Maodeng’s *Voyage of the San Bao Eunuch*,” *Comparative Studies in Society and History* 34 (1992): 227.

however, is that speculation based on regarding Zheng He as an explorer, a Columbus *manqué*, is a chimera stemming from Needham's determination to present the Ming expeditions as embodying the virtues of China in contrast to the vices of the West. It is a great deal more plausible to conjecture what might have happened in world history if the early Ming empire had extended direct political control over the greater East Asian region, a coprosperity sphere *avant la lettre*, which China already dominated economically and culturally.

The quandary which Needham created for historians by casting Zheng He as the "Vasco da Gama of China" usually is resolved by the historian summoning up the contrast, going back to the eighteenth century, between the closed, indifferent nature of China and the restless, driven character of Western society.<sup>163</sup> Despite adequate ships and capable sailors, Ming China "retreated within its own boundaries" and failed to "discover the sea."<sup>164</sup> As a consequence of its self-sufficiency, China committed a "fateful mistake" in turning its back on the world and losing "the race for world dominion."<sup>165</sup> The Chinese are diagnosed as lacking in resolution and resources, willing to renounce exploration and expansion in order to conserve their social order.<sup>166</sup> The Portuguese and Chinese maritime ventures thus are invoked to help "cut the Gordian knot of world history—that is, the origin of the superiority of Europe."<sup>167</sup> According to David S. Landes, the termination of the voyages of Zheng He confirms the incurably complacent nature of the Chinese:

They were what they were and did not have to change. They had what they had and did not have to take or make. . . . Isolationism became China. Round, complete, apparently serene, ineffably harmonious, the Celestial Empire purled along for hundreds of years, impervious and imperturbable.<sup>168</sup>

Needham surely would have loathed the dismissive tone of this formulation, yet, whatever his intentions, his own perception of China as maintaining two millennia of "homeostatic equilibrium" is in essen-

<sup>163</sup> The quotation is Needham's description of Zheng He; SCC 4/3: 502. On the contrast between China and the West, see Mackerras, *Western Images of China*; Andrew L. March, *The Idea of China: Myth and Theory in Geographic Thought* (New York, 1974).

<sup>164</sup> J. H. Parry, *The Discovery of the Sea* (Berkeley and Los Angeles, 1981), p. 16.

<sup>165</sup> Braudel, *Civilization and Capitalism*, 3: 32.

<sup>166</sup> Chaunu, *European Expansion in the Later Middle Ages*, p. 285; Wallerstein, *The Modern World-System*, p. 56; Daniel Chirot, "The Rise of the West," *American Sociological Review* 50 (1985): 66; *How Societies Change* (Thousand Oaks, California, 1994), pp. 65–66.

<sup>167</sup> Braudel, *Civilization and Capitalism*, 2: 134.

<sup>168</sup> Landes, *The Wealth and Poverty of Nations*, pp. 96, 98.

tial agreement with it. He devoted his life to revealing the stunning accomplishments of China, its steady, uninterrupted progress in science and technology through the centuries; but, as with the voyages of Zheng He, his account ignores social, political, and economic contexts. The reader of *Science and Civilisation* has little sense of the circumstances of the achievements being described; they appear to take place in an airless environment, isolated and impassive. Part of this is due to the way Needham homogenizes complex ideas and social groups. In his view, Confucians were the managerial elite of China while "for two thousand years the Taoists fought a collectivist holding action (against them), only to be justified by the coming of socialism in our own time."<sup>169</sup> Nevertheless, he regards Daoists and Confucians as having created a "sagely synthesis" which ensured adamant stability in China. He asserts, without evidence, that Confucians, who were disdainful of scientific and technological research, in their public responsibilities applied discoveries made by Daoist investigators who were ideologically hostile to them.<sup>170</sup> This says more about Needham's faith in the transforming power and synthetic character of ideas than it does about historical realities in China.

A master at threading his way through a series of texts on macrobiotics, orchid cultivation, or portolan maps, Needham displays slight interest in grounding his discussions in change across time or in situating ideas and innovations in social contexts.<sup>171</sup> His China seems to stand outside history: It takes on its essential forms in political structure and ideological outlook no later than the beginning of the Common Era and retains it thereafter, merely casting off its shell of bureaucratic feudalism with the coming of the People's Republic. There is no place in this scheme for declines and spurts of progress, unpredictability and contingency, the unruly complexity of history. Disruption and drama characterize the schizophrenic West, not harmonious China, calmed and cosseted by its Confucian caretakers.<sup>172</sup>

<sup>169</sup> Needham, "Science and Society in Ancient China," p. 176.

<sup>170</sup> On the collaboration of Daoists and Confucians, see SCC 2: 34–35, 132, 161–63; 4/2: 501. On Needham having perhaps created a "non-existent intellectual matrix" in China, see Watson, "History and technological history," p. 185; see also Willard J. Peterson, "'Chinese Scientific Philosophy' and Some Chinese Attitudes towards Knowledge about the Realm of Heaven-and-Earth," *Past and Present* 87 (1980): 26–30.

<sup>171</sup> See Huff, *The Rise of Early Modern Science*, pp. 36–39.

<sup>172</sup> Needham regarded China as harmonious (except for cyclic changes of dynasty) but not as stagnant. He emphasized China's steady rate of progress throughout history, especially in science and technology, while also claiming that "bureaucratic feudalism" imposed significant limits to change (see Needham and Huang, "The Nature of Chinese Society"). See the diagram by Needham (in *Clerks and Craftsmen*, p. 414) illustrating the constant ascent of science in China, in contrast to the precipitous decline and then rapid rise of European science. On the lack of "Dark Ages" in China, see SCC 6/1: xxv, 2–5, 514.

Nor does Needham treat the ever-changing West with greater historical sophistication. Although not without internal coherence and a grain of truth, his depiction of European history amounts to little more than a mechanical application of Marxist clichés that were outdated before the first volume of *Science and Civilisation* appeared. His claims about the impact of Chinese inventions on Europe hinge on unsubstantiated assertions about considerable technological diffusion.<sup>173</sup> While admitting that he sometimes overemphasizes the Chinese technological contribution to the West because he wants “to redress a balance” which has previously favored Europe, he also contends that those who wish to maintain the independence of Western invention in a given case must show that there was no Chinese contribution—that is, they are obliged to prove a negative.<sup>174</sup> He presents no evidence and little argument that the arrival of Chinese innovations in Europe stimulated the Renaissance, capitalism, the absolute state, the Scientific Revolution, and the Industrial Revolution. In assuming that China and the West may be treated as “almost a test-bench experiment” in antithetical values, he merely opposes one unexamined cluster of notions with another, a procedure in which accolades for China and censure for the West substitute for inquiry and evidence. No one has produced such an idealized portrait of China since Voltaire and other sinophiles used its supposed virtues to denounce the corruption and oppression of the *ancien régime*.<sup>175</sup>

As Needham said in the Holorenschaw memoir, he was attracted to the study of China in the first place because he saw it as an opportunity for a “critical appraisal” of his own civilization. China appealed to him as “something equal and opposite to all that in which he himself had been brought up, and something for that very reason of compelling fascination.”<sup>176</sup> It is not surprising, then, that the West appears in his conception of world history as the malevolent antithesis of China. The fervor with which he held to this notion for so long reflects the extent to which *Science and Civilisation* is a product of the Cold War: He conceived of the multi-volume project when the People’s Republic was proclaimed, the first volume was written during the Korean War, the fourth volume (which includes the portrait of Zheng He)

<sup>173</sup> On criticism of Needham’s notion of technological diffusion, see Blue, “Science(s), Civilisation(s), Historie(s),” pp. 49–51.

<sup>174</sup> Needham, *Clerks and Craftsmen in China and the West*, p. 70; *Science in Traditional China*, p. ix.

<sup>175</sup> See Basil Guy, “The French image of China before and after Voltaire,” *Studies in Voltaire and the Eighteenth Century* 21 (1963): 214–84.

<sup>176</sup> See notes 18 and 19.

came out during the Vietnam War, and he finally bowed out of active work on the series around the time that the Soviet Union collapsed.<sup>177</sup> Intense political convictions impelled Needham into the study of China, and contemporary events collaborated in persuading him that his original presumptions remained legitimate.

Placing *Science and Civilisation* in the context of Needham's conception of world history poses a difficulty that perhaps is unique among great works of historical scholarship. The central theses which inspired the work and shaped its arguments are never stated in it. The project was informed by a conception of world history built around the dialectic of China and the West. Furthermore, Needham believed that *Science and Civilisation* played a role in the dialectical progress of history inasmuch as it would contribute to the "great effort of mutual understanding and mutual explanation (which) is needed for the welfare and peace of the future world:" the creation of "an age of unified science" eventually would help usher in a communist utopia.<sup>178</sup> The reader learns no more than a hint of this from *Science and Civilisation*, however. Of course, the theses do appear in Needham's essays, although necessarily dispersed and often inchoate. Sweeping generalizations on China and the West usually are accompanied by the caveat that they require further investigation or that they would be explicated in detail at a later date. For almost four decades, while expressing such reservations, Needham reiterated the supposedly provisional ideas and employed them to frame the arguments of *Science and Civilisation*. This was a strange way to deal with matters which were crucial to the coherence of his project.

It also was no kindness to his readers. In the case of the voyages of Zheng He, Needham's suppositions seriously skewed the presentation of an extraordinary episode in Chinese history (and exerted an unfortunate influence on the writing of world history). Similar problems may be found in his discussions of Chinese natural law, Chinese ecology, the nature of Daoist philosophy and practice, the relationship between Daoist speculation and Confucian statecraft, and, most crucially for world history, the links between Chinese and Western technological innovation. Needham had a bottomless capacity to discover confir-

<sup>177</sup> On Needham's opposition to the Vietnam War, see Timothy E. Powell and Peter Harper, *Catalogue of papers and correspondence of Joseph Needham CH FRS (1900–1995)*, 3 vols. (University of Bath, 1995), 2: 275, 279; 3: 360, 370. On *Science and Civilisation*, as well as reactions to Needham's work, as products of the Cold War, see Blue, "Joseph Needham, Heterodox Marxism, and the Social Background to Chinese Science," p. 197.

<sup>178</sup> See note 14.

mation of his beliefs in what he studied. A historian's objectivity is not enhanced by believing that his work heralds the dawn of the Kingdom of God on earth.

Still, as Needham once declared, "an association with the probably unattainable is common to all the great types of man's activity."<sup>179</sup> The immense scope of *Science and Civilisation in China* is commensurate with the prodigious aspirations of its architect. Whatever its flaws, Needham's masterwork remains an extraordinary achievement, one that would not exist without his personal and political passions. It is certain to outlive the despotic regime established by Mao Zedong, an eventuality that Needham surely would have greeted with profound ambivalence. He moved from the study of science to Chinese history because it brought him, as he saw it, into the arena of politics, where he believed that his work would contribute to the march of social evolution. That has so far turned out not to be the case, and only time will tell to what extent Joseph Needham's political commitments and preconceptions can successfully be disentangled from his monumental labors.

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<sup>179</sup> Needham, *Chemical Embryology*, 1: 4.