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# China and Western Technology in the Late Eighteenth Century

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We have never valued ingenious articles, nor do we have the slightest need of your country's manufactures.<sup>1</sup>

BY THE LATE EIGHTEENTH CENTURY, THE BALANCE OF EUROPEAN OPINION had tilted against China. Westerners, earlier in the century almost uncritical in their admiration, came to the conclusion that the Chinese seemed unwilling, or unable, to improve on their earlier inventions, such as gunpowder and the compass, which formed part of the foundation for Western development. The famous assertion of Chinese self-sufficiency quoted above, made in 1793 by the Qianlong emperor (r. 1736–1795) in response to Lord Macartney's embassy from King George III, seemed to epitomize Chinese aloofness to the potential offered by Western knowledge.<sup>2</sup>

Europeans specifically equated this apparent lack of interest in what the West

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<sup>1</sup> "Yingshi Maga'erni Laipin An" [The Case of the English Macartney Embassy and Their Gifts], *Chang Gu Cong Bian* [Collected Historical Records] (Beiping, 1930–43), 3: 16–24, at 19b.

<sup>2</sup> There is an immense primary and secondary literature on this topic. Among the most influential early firsthand accounts were Jean-Baptiste Du Halde's *Description géographique, historique, chronologique, politique et physique de l'empire de la Chine et de la Tartarie chinoise*, 4 vols. (Paris, 1735–39; The Hague, 1736; English trans., London, 1738, 1741; German trans., 1748), based on missionary descriptions; George Anson, *A Voyage round the World in the Years MDCCXL, I, II, III, IV* (London, 1748; Paris, 1749), based on personal experience on the South China coast; and John Barrow, *Travels in China, containing Descriptions, Observations and Comparisons Made and Collected in the Course of a Short Residence at the Imperial Palace of Yuen-min-Yuen, and on a Subsequent Journey through the Country from Peking to Canton*, 2 vols. (London, 1804), based on the author's observations while in China with Macartney's embassy in 1792–93. On the changing Western views of China during the eighteenth century, see, for example, Basil Guy, *The French Image of China before and after Voltaire* (Geneva, 1963); Louis Dermigny, *La Chine et L'Occident: Le commerce à Canton au XVIII<sup>e</sup> siècle, 1719–1833*, 4 vols. (Paris, 1964), esp. "Mythe et réalité de la Chine," 1: 11–80.

had to offer with a lack of interest in science and practical technology, because at that time the West had come to define itself in terms of, and derive a strong sense of superiority from, its undoubted technological power. From such a perspective, it was an easy step to regarding the Chinese as inferior in an overall sense. These views took firm hold as the nineteenth century unfolded and have remained tenacious to this day. Although scholars have recently exploded the myth of China's "opposition" to Western science, it remains widely believed, and, in the case of technology, neither the conviction of the Chinese lack of interest nor the assumptions on which it rested have been subjected to serious inquiry.<sup>3</sup>

Yet the situation in the eighteenth century was far more complex than Qianlong's public declaration suggests. In the preceding decades, he and a number of others in China had displayed considerable interest in all manner of things Western, particularly science and technology. Although this interest was duly recorded by a range of Western observers and made widely available to their European readers, the overwhelming body of opinion disregarded that evidence in favor of the attitudes outlined above.

This essay draws on both Chinese and Western archival and published sources to argue that, for different reasons, the imperial expression of disdain and Western readiness to accept it were primarily prompted by internal political agendas rather than by actual circumstances and that, as a result, the whole tenor of early Sino-Western relations was based on false premises. More accurate evaluation of the genesis and development of Sino-Western mutual perceptions will help correct a misapprehension whose effects are still evident two centuries after the Macartney mission.<sup>4</sup> The essay analyzes Chinese use of Western knowledge and technical skill in the late eighteenth century, focusing principally on the sequence of events in China in the military sphere. This context was central to Western assumptions of superiority because military culture, including the civil-military relationship, has been and continues to be of signal importance to a proper understanding of China. Yet the extraordinary influence of Chinese civilian culture has led to an unfortunate neglect of these issues.

The circumstances that gave rise to the misunderstanding, the background to

<sup>3</sup> For Western views, see Michael Adas, *Machines as the Measure of Men: Science, Technology, and Ideologies of Western Dominance* (Ithaca, N.Y., 1989); Carlo M. Cipolla, *European Culture and Overseas Expansion* (London, 1970); William H. McNeill, *The Pursuit of Power: Technology, Armed Force, and Society since A.D. 1000* (Chicago, 1982); Joel Mokyr, *The Lever of Riches: Technological Creativity and Economic Progress* (New York, 1990); Theodore von Laue, *The World Revolution of Westernization: The Twentieth Century in Global Perspective* (New York, 1987). On Chinese attitudes, see Pasquale M. d'Elia, *Galileo in China: Relations through the Roman College between Galileo and the Jesuit Scientist-Missionaries (1610-1640)*, Rufus Suter and Matthew Sciascia, trans. (Cambridge, Mass., 1960); Huang Yilong, "Tang Ruowang yu Qingchu Xili zhi Zhengtonghua" [Tang Ruowang (Adam Schall) and the Regularization of Western Astronomy in the Early Qing], *Xinbian Zhongguo Kezhi Shi* [Newly Edited History of Chinese Technology], vol. 2 (Taipei, 1990); Nathan Sivin, "Copernicus in China," in *Colloquia Copernicana II: Etudes sur l'audience de la Théorie Héliocentrique* (Warsaw, 1973); Sivin, "On 'China's Opposition to Western Science during Late Ming and Early Ch'ing,'" *Isis*, 56 (1965): 201-05; Wang Ping, *Xifang Lisuanxue zhi Shuru* [The Importation of Western Astronomical Knowledge] (Nangang, Taiwan, 1966); Harriet Zurndorfer, "Comment la science et la technologie se vendaient à la Chine au XVIII<sup>e</sup> siècle," *Etudes chinoises*, 7 (Autumn 1988): 59-90. See also Nathan Sivin, "Science and Medicine in Imperial China: The State of the Field," *Journal of Asian Studies*, 47 (February 1988): 41-90.

<sup>4</sup> See, for example, Alain Peyrefitte, *L'empire immobile, ou, Le choc des mondes: Récit historique* (Paris, 1989; English trans., New York, 1992).

which is described in detail below, were essentially as follows. In a manner familiar to those who deal today with Chinese foreign relations, Qianlong's public declaration had a double edge and was intended for a multiple audience. For a variety of reasons, he preferred not to admit publicly his interest in and awareness of the potential of foreign technology. His motivation becomes clearer when the episode is placed within the context of late eighteenth-century Chinese politics. The Manchu Qing dynasty (1644–1911) imposed and ultimately maintained its rule over China by military means while at the same time seeking to present to its Chinese subjects and the world at large an image that was both thoroughly Confucian and ethnically even-handed. For the Qianlong emperor, these somewhat contradictory goals meant, among other things, that he made a virtue of his own civilian accomplishments yet simultaneously leaned toward military culture by, for example, promoting the martial traditions of the Manchus; by awarding high civil office (usually the prize of scholars successful in a series of competitive examinations based on classical Chinese texts) to successful generals, almost all of whom were Manchus; by prohibiting the private possession of any weapon; and by jealously guarding access to all information, especially any that smacked of technology, conceivably of use to would-be rebels. No less important, the emperor's aspirations to universal authority combined with acute political factionalism and the gradual onset of a crisis of dynastic self-confidence to render any suggestion of a lack of imperial autonomy wholly out of the question.<sup>5</sup> Thus the famous statement can be understood, on the one hand, as a piece of propaganda directed at a domestic audience with the dual objectives of morale boosting and intimidation.

On the other hand, the statement was, of course, directed at the king of England through his envoy Macartney and, by extension, at any other foreigners who might individually or collectively seek to alter the structure of China's foreign relations to the disadvantage of ultimate Chinese control. In this context, the emperor's disingenuousness conformed to a pattern dating back at least to the early seventeenth century and still discernible today. According to this pattern, the Chinese have consistently sought to absorb Western practical technical skills while remaining inimical to Western ideologies. This dichotomy originated with the attempted use by Christian missionaries of Western scientific and technical expertise as a means of arousing Chinese interest in the Christian religion. Many Chinese, although they fully grasped the utility of the practical knowledge, were hesitant to adopt it because it seemed inseparable from Christianity; accustomed to a political system in which ideology specifically either served orthodox authority or constituted rank heresy, they sensed the subversive potential of the foreign religion.<sup>6</sup> Thus, as we shall see, when rebels threatened the Qing dynasty in the late seventeenth century, the Kangxi emperor (r. 1661–1722) was happy to

<sup>5</sup> On Qianlong's view of his own monarchy, see Pamela Kyle Crossley, "The Rulerships of China," *AHR*, 97 (December 1992): 1468–83; Crossley, "Manzhou Yuanliu Kao and the Formalization of the Manchu Heritage," *Journal of Asian Studies*, 46 (November 1987): 761–90; Harold L. Kahn, *Monarchy in the Emperor's Eyes: Image and Reality in the Ch'ien-lung Reign* (Cambridge, Mass., 1971); Beatrice S. Bartlett, *Monarchs and Ministers: The Grand Council in Mid-Ch'ing China, 1723–1820* (Berkeley, Calif., 1991); Philip A. Kuhn, *Soulstealers: The Chinese Sorcery Scare of 1768* (Cambridge, Mass., 1990).

<sup>6</sup> Jacques Gernet, *China and the Christian Impact: A Conflict of Cultures* (Cambridge, 1985).

improve his arsenal under Jesuit direction, yet he clearly recognized the actual and symbolic threat that papal authority over Chinese Christians would pose and rejected it absolutely. In the eighteenth century, even as Western missionaries' technical advice helped save Qing armies, Christian efforts to proselytize in the provinces were met with persecution. Subsequently, in the late nineteenth century, certain Chinese reformers sought to acquire the Western technology that would bring their nation wealth and power without abandoning the indigenous intellectual tradition. In a twentieth-century variation on this theme, Chinese leaders of the early People's Republic resisted subservience to Soviet control even at the cost of substantial setbacks in technical programs, such as building the atomic bomb, that were intended to bring China into a position of equality with its principal ideological foe, the United States. Most recently, Chinese rulers have continued to be wary of Western ideas, initiating campaigns against "spiritual pollution," "bourgeois liberalization," and "peaceful evolution" (to capitalism), and have endeavored to introduce economic reform in isolation from political reform.

In other words, the Chinese, and their rulers, have uniformly displayed a powerful reluctance to surrender authority or autonomy to any outsider or even to take a chance of doing so. This attitude must be distinguished from the isolationism, the hostility to innovation, especially when of foreign origin, and the immutable sense of superiority for which it has often been mistaken.

Responsibility for the late eighteenth-century miscommunication cannot, however, be laid entirely on the Chinese, for the shift in European views of China, like the Chinese denial of interest in the West, tended to reflect internal, subjective conditions rather than a change in China itself. The eyewitnesses who made note of Chinese interest in the West and what it had to offer included Jesuit missionaries, whose correspondence was published and widely read in Europe at the time, and members of Macartney's mission, who recorded it in their memoirs of the embassy. Unfortunately, these observations came to be superseded in Western minds by the impression, recorded in other such accounts, of the Chinese as sorely deficient in the inquiring and progressive spirit that Europeans considered one of their own culture's most enviable characteristics. There were a number of reasons for this. One was the steady decline of the Society of Jesus, whose members had once held a virtual monopoly on the interpretation of China to Europe. The triumph of those who opposed the Jesuits (the Society was abolished in 1773) seemed to confirm the unreliability of Jesuit accounts. At least as important an influence on changing European views of China was a series of momentous developments in Europe, in particular industrialization and the new focus on political liberty, with all the profound intellectual shifts that accompanied these metamorphoses.

The period of Sino-Western interaction that concerns us began with the arrival in China of Catholic missionaries in the late sixteenth century. Among these, Jesuits were the most conspicuously successful, in part because of their "top down" strategy, which brought them access to the country's elite and to the imperial court. The cartography and more direct military involvement of some of the early luminaries of the Jesuit mission are well known; these are briefly

recapitulated, however, since they created for both the missionaries and their Chinese hosts significant precedents for the events in the eighteenth century on which the main body of this essay turns.

JESUIT MISSION STRATEGY IN CHINA was controversial for its accommodative approach and for its attempts to arouse the interest of Chinese literati in Western scientific and technical knowledge.<sup>7</sup> Among the most impressive achievements made in the course of these endeavors were those in the realms of cartography and geography, then advancing by major strides in Europe. Thus Matteo Ricci (1552–1610) produced in 1602 a world map that intrigued his Chinese contacts, even attracting the attention of at least one of the late-Ming emperors; in 1674, Ferdinand Verbiest (1623–1688), who built many of the instruments that can still be seen today at the Jesuit Observatory in Beijing, brought out an updated version of the world map that synthesized the knowledge acquired in the intervening decades. Other important early work in this area included the *Novus atlas sinensis* of Martinus Martini (1631–1661), published in 1655.<sup>8</sup>

Some Jesuit missionaries who displayed exceptional talent in these realms sowed the seeds of military assistance to the Chinese. Since classical antiquity, the Chinese had been well aware of the military significance of cartography, for the classic *Art of War* by the great strategist Sun Zi (Sun Tzu) had stressed the importance of “knowing one’s terrain.”<sup>9</sup> That lesson was not lost on successive rulers of the seventeenth century, the first half of which saw almost continuous warfare as the result of the dynastic transition. The seeds began to bear fruit during the period of dynastic consolidation under the Kangxi emperor.

His reign coincided with the high tide of Jesuit influence in China. Kangxi himself greatly valued Jesuit cartography; under his auspices, missionaries undertook a ten-year survey of the entire empire that formed the foundation for all subsequent geographic study of China—incidentally offering the missionaries

<sup>7</sup> The literature on the Jesuit mission to China is huge. For bibliographic references, see Carlos Sommervogel, *Bibliothèque de la Compagnie de Jésus*, 12 vols. (Brussels and Paris, 1890–1932); Erik Zürcher, Nicolas Standaert, and Adrianus Dudink, *Bibliography of the Jesuit Mission in China: Ca. 1580–ca. 1680* (Leiden, 1991); Robert Streit and Johannes Dindinger, *Bibliotheca missionum* (Rome, 1951–73), vol. 7: *Chinesische Missionsliteratur, 1700–1799*. See also Joseph Dehergne, “Les Archives des Jésuites de Paris et l’histoire des missions aux XVII<sup>e</sup> et XVIII<sup>e</sup> siècles,” *Euntes docete*, 21 (1968): 191–213; Dehergne, *Répertoire des Jésuites de Chine de 1552 à 1800* (Rome, 1973); Antoine Gaubil, *Correspondance de Pékin, 1722–1759*, Renée Simon, ed. (Geneva, 1970); Louis Pfister, *Notices biographiques et bibliographiques sur les Jésuites de l’ancienne mission de Chine, 1552–1773* (Shanghai, 1932). On Jesuit accommodation, see David E. Mungello, *Curious Land: Jesuit Accommodation and the Origins of Sinology* (1985; rpt. edn., Honolulu, 1989).

<sup>8</sup> Jonathan D. Spence, *The Memory Palace of Matteo Ricci* (New York, 1984), 64–65, 149. The 1602 map was a revised version of one Ricci had made in 1584. On Verbiest, see Minako Debergh, “Une carte oubliée du P. Ferdinand Verbiest,” *Journal asiatique*, 277 (1989): 159–219; I am indebted to Franciscus Verellen for drawing my attention to this article. On Martini, see Mungello, *Curious Land*, 116–24.

<sup>9</sup> Sun Zi’s dates are uncertain; he probably lived sometime between the fifth and first centuries B.C. In 221 B.C., the conquering first emperor had assembled all available maps, presumably with a view to keeping the information to himself. A chapter of the ancient text *Guanzi* concerns military maps; it is unclear whether this in fact predates the Han dynasty (206 B.C.–220 A.D.). Joseph Needham, *Science and Civilization*, Vol. 3, *Mathematics and the Sciences of the Heavens and the Earth* (Cambridge, 1959), 535–36.

the opportunity to proselytize in areas they otherwise might never have been able to visit. This survey was later engraved for the Chinese on forty-four copper plates by Abbé Matteo Ripa (1682–1745).<sup>10</sup> Other Chinese-sponsored Jesuit cartography focused on outlying regions, extending far beyond the imperial frontiers toward the borders of Russia and Persia. One of the most notable exponents was Antoine Gaubil (1689–1759), who in addition to drawing maps recorded his observations about the areas in which he traveled, very much in the Chinese tradition of descriptive geography.<sup>11</sup> Although Chinese expertise in cartography was already considerable, the Chinese particularly admired the greater precision of Western techniques for drawing and reproducing maps. Recognizing the Westerners' evident superiority in astronomy, which involved techniques similar to those required for land surveys, they appointed a Jesuit missionary in 1644 to direct the Imperial Board of Astronomy, and Jesuits filled this position for over a century.<sup>12</sup>

The Kangxi emperor was profoundly interested in all manner of Western practical knowledge, employing missionaries to instruct him in Western technology, science, and music. Notably, he sought to advance the dissemination of Western scientific and technical knowledge by his patronage of a number of mathematicians and astronomers and by the promotion of relevant publications, including, for example, a compendium of mathematics (*Shu Li Jing Yun* [Collected Essentials on Numbers and Their Principles]) that included a portion of Euclid translated by Ricci.<sup>13</sup>

One area of Western knowledge that especially interested Kangxi was artillery. Gunpowder, invented by the Chinese in the tenth century, had found its way to Europe three centuries later with the Mongols. Spurred on by the constant warfare between the European states, the use of artillery had developed to a more advanced stage in Europe than in China. Western cannon were relatively light and mobile, although the evidence suggests that the Chinese still retained an advantage in the technology of gunpowder, as distinct from that of weapons construction.<sup>14</sup> In the early sixteenth century, European traders brought their armaments and their iron and bronze casting techniques back across the world to China through Japan, India, and Southeast Asia; by no later than the 1620s, Chinese workers were casting cannon in Macao under the direction of Portuguese

<sup>10</sup> Pfister, *Notices biographiques et bibliographiques*, 608 (biography of Fridelli, one of those who worked on the Kangxi survey): "dans ses immenses voyages . . . il . . . ne manqua jamais l'occasion d'annoncer l'Évangile et de prêcher aux Païens."

<sup>11</sup> Gaubil, *Correspondance de Pékin*, esp. 235–37, letter of October 13, 1729; Henri Bernard, "Les étapes de la cartographie scientifique pour la Chine et les pays voisins depuis le seizième jusqu'à la fin du dix-huitième siècle," *Monumenta serica*, 1 (1935): 428–76, at 466–70; Pfister, *Notices biographiques et bibliographiques*, 666–93.

<sup>12</sup> On the association of astronomy and cartography since antiquity in China, see Needham, *Science and Civilization*, 3: 542; on Europe, see Josef W. Konvitz, *Cartography in France, 1660–1848: Science, Engineering, and Statecraft* (Chicago, 1987), 4. On the significance of astronomy to the Chinese, see Gernet, *China and the Christian Impact*, 61–62.

<sup>13</sup> See Wang, *Xifang Lisuanxue zhi Shuru*, esp. 69–74.

<sup>14</sup> See McNeill, *Pursuit of Power*, 81–89; Needham, *Science and Civilization*, Vol. 5, *Chemistry and Chemical Technology*, part 7, "The Gunpowder Epic" (Cambridge, 1986), 139–41, and 398–407, where Needham argues persuasively for the achievements of Chinese indigenous artillery in the early seventeenth century.

gun founders, whose work was already in demand throughout colonial Asia.<sup>15</sup> At the suggestion of high-ranking Chinese converts, these Portuguese artillery technicians more than once were invited north from Macao to help the Ming against the Manchus.

Meanwhile, at court, the lucidity of the first incumbent at the Imperial Board of Astronomy, Adam Schall (1592–1666), on the usefulness of artillery for the defense of Beijing led to an order that he direct the casting of cannon for the failing dynasty. His principal contribution was the production of smaller and less unwieldy siege guns. He reduced their size from 75-pounders to 40-pounders, eventually producing over five hundred pieces.<sup>16</sup> Schall also collaborated with a Chinese colleague on a work about gunnery titled *Ze Ke Lu* (Record of Immediate Conquest), also known as *Huo Gong Jie Yao* (Essentials of Gunnery). Originally published in 1643, it was reprinted in 1841 at the height of the Opium War.<sup>17</sup>

Schall was succeeded as director of the Board of Astronomy by Ferdinand Verbiest, whom Kangxi, beset by rebellion, soon pressed into cannon founding as well.<sup>18</sup> Verbiest's task, much as Schall's had been, was to cast lighter and more mobile artillery than the Manchus already possessed, capable of being carried over mountains and rivers. Rather than introducing imported Western types, he improved on Chinese cannon, lengthening the barrels and in some cases using different materials.<sup>19</sup> Over a fifteen-year period, his cannon foundry produced almost five hundred artillery pieces, made of cast iron and bronze, which were used both in the suppression of the Rebellion of the Three Feudatories (1673–1681) and in the Russian campaigns of 1685–1686. The foundry continued in operation after his death in 1688, and the Chinese were still using his designs at the time of the Opium War in 1839.<sup>20</sup> Indeed, the cannon made by Schall and Verbiest remained an important part of the imperial arsenal until the end of the

<sup>15</sup> Charles R. Boxer, "Asian Potentates and European Artillery in the +16th to +18th Centuries: A Footnote to Gibson-Hill," *Journal of the Malayan Branch of the Royal Asiatic Society*, 38, part 2 (December 1965): 156–72, at 169; see also Geoffrey Parker, *The Military Revolution: Military Innovation and the Rise of the West, 1500–1800* (Cambridge, 1988), 136–40.

<sup>16</sup> Whereas earlier Chinese cannon had been comparable to the largest of contemporary European artillery, the size of Schall's cannon corresponded to some of the smallest in Europe, at the same time probably reducing the range from approximately 750 to approximately 400 yards. See R. Ernest Dupuy and Trevor N. Dupuy, *Encyclopedia of Military History from 3500 B.C. to the Present*, 2d rev. edn. (New York, 1986), 453.

<sup>17</sup> Jiao Xu, *Ze Ke Lu*, also known as *Huo Gong Jie Yao* (n.p., 1841); Needham, *Science and Civilization*, vol. 5, part 7, 394; Pfister, *Notices biographiques et bibliographiques*, 165; Jonathan D. Spence, *To Change China: Western Advisers in China, 1620–1960* (1969; rpt. edn., New York, 1980), 15.

<sup>18</sup> For Kangxi's order, see *Daqing Shengzu Shilu* [Veritable Records of the Kangxi Emperor], *juan* 49, 6b, 13/8/11 (September 10, 1674). Initially reluctant to comply, as Schall had been before him, Verbiest yielded only in the face of the emperor's threat to execute him and expel all Christians from China. Yet his insistence that priests were men of peace who knew nothing of the techniques of war was disingenuous. Jesuits were notorious for their predilection for "unpriestly," that is, political, activity. Ignatius Loyola, the founder of the Jesuit order, was a soldier who embarked on a religious career only after being wounded. He originally called the Society a "company" so as to express the soldierly spirit of loyalty to the captain, Jesus.

<sup>19</sup> Louis Le Comte, *Nouveaux mémoires sur l'état présent de la Chine* (Paris, 1696), 2: 246, 248. On Le Comte as an early critic of Chinese science and technology, and his influence, see Adas, *Machines as the Measure of Men*, 81–83.

<sup>20</sup> See Shu Liguang, Hu Jianzhong, and Zhou Cheng, "Nan Huairen yu Zhongguo Qingdai Zhuzao de Dabao" [Ferdinand Verbiest and the Casting of Cannon in China during the Qing], *Gugong Bowuyuan Yuankan* (1989): 28, citing the Imperial Household Archives, Beijing.

dynasty.<sup>21</sup> In a curious quirk of history, a number of these weapons are now in European museums, having been captured during foreign wars of the nineteenth century.<sup>22</sup>

Verbiest titled his treatise on artillery and ballistics, published around 1681 but now lost, *Shenwei Tushuo* (Explanations and Illustrations of [the Cannon Named] Wonderful and Terrible). In this work, he wrote on the importance of uniformity in the weight of cannonballs and on the critical difference a cannon's angle of elevation could make to its accuracy. If soldiers knew the exact distance between the target and the gun, and the weight of the cannonball, they could accurately hit their targets. The unmistakable implication, and one with important reverberations almost a century later, was that accurate land surveys were just as critical for this purpose as for merely "knowing one's terrain."<sup>23</sup>

Jesuit influence in China gave rise to tremendous hostility on the part of competitors in the mission field and in the highly factionalized European Catholic establishment. Thus it was hardly surprising that Verbiest's "unpriestly" activities as a cannon founder should have prompted virulent condemnation, such as that published by the Dominican priest, Domingo Navarrete (d. 1689) in Madrid in 1676. Yet Verbiest had powerful support. In 1681, Pope Innocent XI praised him publicly for "having used the profane sciences for the safety of the people and the advancement of the Faith."<sup>24</sup> Jesuit cartography was harder to criticize than their gun founding because it helped to disseminate accurate information about China in the West as well as to serve Chinese purposes. For example, the missionary survey of the empire undertaken for the Kangxi emperor was reproduced in Europe, with revisions: in France by the celebrated geographer Jean-Baptiste Bourguignon d'Anville (1697–1782) in the early 1730s and in Holland a few years later.<sup>25</sup> Appearing in 1735 as a supplement to the first comprehensive European account of China—Du Halde's *Description géographique . . . de la Chine*—it intrigued a Europe still enthusiastic about China and hungry for direct information.

Jesuit influence in Beijing declined sharply after a papal mission in 1705–1706 attempted to extend Rome's authority over Chinese Christians. This move served only to confirm the worst Chinese suspicions about the Western religion and resulted in failure. Missionary involvement in the succession dispute that embittered the first decades of the eighteenth century in China further eroded Jesuit

<sup>21</sup> *Qingdai Chouban Yiwu Shimo* [Annals of the Management of Barbarian Affairs during the Qing Dynasty, Tongzhi Reign (1862–1874)] (Beiping, 1930), 100 *juan*, 1863: 35a-b, which indicates that Schall's pieces were still in use at least in the eighteenth century. Thus the suggestion of Arnold H. Rowbotham, *Missionary and Mandarin: The Jesuits at the Court of China* (Berkeley, Calif., 1942), 97, that Verbiest was pressed into service as a cannon founder because Schall's cannons were "either too heavy for field purposes or had fallen into disrepair," was mistaken.

<sup>22</sup> For a table showing the location of Verbiest's cannon in European museums, see Giovanni Stary, "The 'Manchu Cannons' Cast by Ferdinand Verbiest and the Hitherto Unknown Title of His Instructions" (forthcoming), 6. I am indebted to Professor Stary for making this work available to me. For specifications of cannon cast at this time, at least some of which were almost certainly under Verbiest's direction, see also *Daqing Huidian Shili* [Institutes and Precedents of the Great Qing] (1899; rpt. edn., Taipei, 1976), *juan* 894, 1a-5a.

<sup>23</sup> Du Halde, *A Description of the Empire of China . . .* (English edition), vol. 2, 82; Stary, "Manchu Cannons"; Shu, Hu, and Zhou, "Nan Huai ren yu Zhongguo Qingdai Zhuzao de Dabao," 30.

<sup>24</sup> See Rowbotham, *Missionary and Mandarin*, 98, 247. The laudatory papal brief appeared in the same year as Verbiest's own defense against Navarrete's attack, *ibid.*, 314.

<sup>25</sup> Bernard, "Les étapes de la cartographie scientifique," 462; Konvitz, *Cartography in France*, 33–35.

prestige; both the Yongzheng emperor (1723–1735) and the Qianlong emperor banned missionaries altogether from the provinces, although few if any specific steps were taken to eradicate Christianity in China. In Europe, the failure of the papal mission also hastened the Jesuits' decline because many Catholics, feeling much the same as did the Chinese, feared the consequences of surrendering church control over Chinese converts.

By the 1770s, profound disagreement among Jesuits in Beijing regarding the appropriate response to the papal brief that suppressed their order around the world weakened the mission's already unpopular cause in the eyes of the Chinese, who nonetheless maintained their strong interest in missionaries' scientific knowledge and technical skills.<sup>26</sup> Under Chinese auspices and at their behest, European missionaries at the Qianlong court carried out a range of technical activities themselves and trained Chinese in many of the necessary skills. They designed an imperial palace near Beijing and installed European-style fountains there; they made elaborate clocks and mechanical toys; they provided technical advice on glassmaking and supervised its production, constructing furnaces of their own design; they built complicated hydraulic and other machinery, for the operation and function of which they provided detailed explanations in response to Chinese requests; and they assembled devices for applying electroconvulsive shock treatment for nervous illness, administering it with some success. These activities met with an enthusiastic response from the emperor, imperial family members, and government officials. Missionaries also helped further Qianlong's military ambitions by offering instruction on the use and construction of firearms and by mapping newly conquered areas; and they made copper engravings of maps and pictures of Chinese military victories or arranged to have such engravings made for the Chinese in France until they could train Chinese to do the job.<sup>27</sup> With one exception—advice on artillery—none of these activities was in any sense covert.

<sup>26</sup> See Joseph Krahl, *China Missions in Crisis: Bishop Laimbeckhoven and His Times, 1738–1787* (Rome, 1964), 223 and following; see also Bernward Willeke, *Imperial Government and Catholic Missions in China during the Years 1784–1785* (St. Bonaventure, N.Y., 1948), 14–15.

<sup>27</sup> In Western sources, a large part of the evidence for Chinese interest in Western science and technology can be found in Jesuit correspondence from Beijing, circulated at the time and now located in the Bibliothèque de l'Institut de France, Paris (hereafter, Bib. Inst.), ms. vols. 1515–24; Archivum Romanum Societatis Iesu, Rome (hereafter, ARSI), Fondo Gesuitico and Jap. Sin. collections; Henri Cordier, "Les correspondants de Bertin, secrétaire d'état au XVIII<sup>e</sup> siècle," *T'oung Pao*, 2<sup>e</sup> série, 14 (1913): 227–57, 465–72, 497–536; *T'oung Pao*, 2<sup>e</sup> série, 18 (1917): 295–379; *Lettres édifiantes et curieuses écrites des missions étrangères*, 14 vols. (Lyon, 1819, orig. pub. in Paris, 1702–76, and subsequently rearranged) (hereafter, *LEC*), vol. 13. For some of the extensive secondary literature, see, in addition to the works by d'Elia, Sivin, Wang, and Zurndorfer cited in note 3, and specific references cited in the remaining notes below, P. Huard and M. Wong, "Les enquêtes françaises sur la science et la technologie chinoises au XVIII<sup>e</sup> siècle," *Bulletin de l'École Française d'Extrême-orient*, 53 (1966): 137–226; Cécile Beurdeley and Michel Beurdeley, *Giuseppe Castiglione: A Jesuit Painter at the Court of the Chinese Emperor*, Michael Bullock, trans. (London, 1972); Cheryl Ann Semans, "Mapping the Unknown: Jesuit Cartography in China, 1583–1773" (Ph.D. dissertation, Geography, University of California, Berkeley, 1987); Nathan Sivin, "Wang Hsi-shan," *Dictionary of Scientific Biography*, 15 vols. (New York, 1970–78), 14: 159–68; Yang Boda, "A Brief Account of Qing Dynasty Glass," in Claudia Brown and Donald Rabiner, *The Robert H. Clague Collection: Chinese Glass of the Qing Dynasty, 1644–1911* (Phoenix, Ariz., 1987), 71–86.

BOTH EUROPEAN AND CHINESE SOURCES indicate that Qianlong personally demonstrated a clear interest in Western science and technology only a few years before the rebuff to King George. In a series of conversations held in 1773, Qianlong quizzed the missionary Michel Benoist (1715–1774) about Western science, philosophy, warfare, cartography, shipping, and navigational practices.<sup>28</sup> During the 1770s and early 1780s, as the suppression of the order caused the flow of Jesuit missionaries to dwindle, the emperor on several occasions reiterated his desire that more missionaries be sent to serve at the imperial court.<sup>29</sup> Even in 1793, the emperor's response to his British visitors belied the assumption of his indifference, for he had them demonstrate several of the instruments with which they presented him; the single gift that most intrigued him was a model of the 110-gun warship *Royal Sovereign*, about which he asked an impressive number of technical questions. His response echoed the preoccupation with artillery that the emperor displayed in correspondence with his generals.<sup>30</sup>

The West and its scientific knowledge did not excite the interest of the Qianlong emperor alone. It also interested a number of leading scholars of the day, particularly those associated with the evidential research (*kaozheng*) movement, then a major force in intellectual life. Influential scholars such as Dai Zhen (1724–1777), Qian Daxin (1728–1804), and Ruan Yuan (1764–1849) recognized the relevance of Western scientific methods to the *kaozheng* quest for precision and accuracy in all aspects of scholarly endeavor. These and other scholars sought to incorporate Western knowledge on mathematics and astronomy and renewed their interest in the indigenous Chinese scientific and technical tradition. One example of this trend was a 1799 publication, *Chouren Zhuan* (Biographies of Astronomers and Mathematicians), compiled by Ruan in collaboration with Qian and others, which among other things summarized the works of almost three hundred mathematicians and astronomers, thirty-seven of whom were Westerners.<sup>31</sup>

The attitudes of Chinese scholars toward foreign scholarship varied. Some were reluctant to acknowledge the source of the Western scientific information they found so compelling, but they did not on that account reject it. Instead, they sought legitimation for their studies by asserting that Western knowledge had

<sup>28</sup> See, for instance, undated letter of Michel Benoist, in *LEC*, 13: 427–45. It was in this conversation that the emperor asked Benoist whether “your Western philosophers have solved a problem that has much exercised our philosophers here: which came first, the chicken or the egg?” *ibid.*, 441. On Qianlong's curiosity about the West, see also Benoist's letter of November 16, 1773, reproduced in *T'oung Pao*, 2<sup>e</sup> série, 18 (1917): 341–49; George Staunton, *An Authentic Account of an Embassy from the King of Great Britain to the Emperor of China*, 3 vols. (London, 1797), 3: 141.

<sup>29</sup> See, for example, *Daqing Gaozong Shilu* [Veritable Records of the Qianlong Emperor of the Great Qing] (Tokyo, 1937–38), *juan* 1066, 21a–b, 43/9/8; *juan* 1130, 9b–10a, 46/5/3. (Chinese dates are cited as follows: year of reign, lunar month, day; a *juan* is comparable to a chapter.) The emperor called a halt to the visits of missionaries in 1785 because he had enough Westerners working for him. See *juan* 1240, 14a–b, 50/10/8.

<sup>30</sup> Staunton, *Authentic Account*, 3: 140–41. See also John Cranmer-Byng and Trevor Levere, “A Case Study in Cultural Collisions: Scientific Apparatus in the Macartney Embassy to China,” *Annals of Science*, 38 (1981): 503–25. On Qianlong's preoccupation with artillery, see, for example, Nayancheng, *A Wencheng Gong Nianpu* [Chronological Biography of Master A Wencheng (Agui)], 8 vols. (n.p., 1813), *juan* 15–16.

<sup>31</sup> Ruan Yuan, Ling Tingkan, Qian Daxin, and Jiao Xun, eds., *Chouren Zhuan* [Biographies of Mathematicians and Astronomers] (n.p., 1799). On this text, see Zurndorfer, “Comment la science et la technologie se vendaient à la Chine au XVIII<sup>e</sup> siècle,” 75–76; Yoshio Mikami, “The Ch'ou-jen Chuan of Yuan Yuan,” *Isis*, 11 (January 1928): 123–26.

been transmitted from China, or they criticized the Confucian tradition for preferring metaphysics to mathematics. Some of the information emanating from the West seemed suspect to Chinese intellectuals because of its inconsistencies. Earlier church restrictions on the missionaries had prevented them from revealing the full extent and import of the discoveries by men such as Copernicus and Galileo. When, in the mid-eighteenth century, the uncensored version of Copernican theory finally reached China, Chinese intellectuals were cautious about embracing it precisely because it seemed to contradict the earlier version. The Western attribution of this skepticism to an ingrained Chinese hostility to foreign ideas thus failed to reflect the true sequence of events. Indeed, one may question whether the incomplete way in which some of the new knowledge was transmitted to China may not actually have interfered with scientific progress in China.<sup>32</sup>

Members of the eighteenth-century elite were also cautious about showing too much interest in Western military technology but for different reasons relating to the complicated quagmire of Manchu-Chinese relations. Some senior Manchus, notably those involved in conducting a series of contained military campaigns, were understandably interested in any technology that might bring them victory. For many such men, military success was a surer path to political power than the civil service examinations in which they would have faced fierce competition from Chinese scholars.<sup>33</sup> This situation was complicated by the Qing policy of being and appearing to be legitimately Confucian rulers, which included downplaying military achievement despite the access to political power it often provided.

For others curious about Western military technology, the issues were somewhat different, because Manchu sensitivities to slurs against their alien origin and hence their legitimacy inhibited the open expression by scholars, most of whom were Chinese, of any such interest. Thus the private dissemination of military information, such as the technology detailed in earlier military compendia and anything susceptible of interpretation as anti-dynastic or in general "prejudicial to national security," was banned; any breach was subject to severe punishment. Although this prohibition undoubtedly exercised a constraining influence, a scattering of relevant literary material indicates it failed to suppress such interest altogether. Most such literature dates from the last decade of the eighteenth century (after the Macartney mission) or the early nineteenth century; by this time, censorship had relaxed somewhat, and unstable conditions within China were beginning to bring military information to the forefront of scholarly attention. For example, in the 1790s, the well-connected scholar Sun Xingyan (1753–1818) produced a new annotated edition of Sun Zi (*Sun Zi Shi Jia Zhu* [Sun Zi with Commentaries]), and an official who had been besieged by rebels in Guizhou province produced a detailed manual on urban defense based on personal experience (*Wu Pei Ji Yao* [Collected Essentials of Military Prepared-

<sup>32</sup> See Sivin, "Copernicus in China"; Wang, *Xifang Lisuanxue zhi Shuru*, 80–88; Benjamin A. Elman, *From Philosophy to Philology: Intellectual and Social Aspects of Change in Late Imperial China* (Cambridge, Mass., 1984), 62–64, 80–83; Annping Chin and Mansfield Freeman, *Tai Chen on Mencius: Explorations in Words and Meaning; A Translation of the Meng Tzu tzu-i shu-cheng* (New Haven, Conn., 1990), 8, 179 n. 36; Zurndorfer, "Comment la science et la technologie se vendaient à la Chine au XVIII<sup>e</sup> siècle," esp. 75–76.

<sup>33</sup> See Bartlett, *Monarchs and Ministers*.

ness]). In 1833, Zhao Xuemin's work on fireworks (*Huo Xi Lue* [Treatise on Fireworks]), written and probably privately circulated in the mid-eighteenth century, was published; it included detailed information on the composition of gunpowder that could in theory have been adapted for subversive purposes by enemies of the state.<sup>34</sup>

Military matters played a salient role in Western, especially Jesuit, interpretations of China during the second half of the eighteenth century and in missionary activities on behalf of the Qing. In this respect, one important figure was Jean-Joseph Marie Amiot, who lived in Beijing from 1751 to 1793. Amiot maintained a voluminous correspondence with the French minister and sometime comptroller-general, Henri Bertin (1720–1792), then one of the China mission's principal supporters in France and a man whose own fascination with military affairs encouraged Amiot to develop a strong interest in and knowledge of Chinese military affairs. Amiot's letters to Bertin repeatedly addressed such topics as the structure of the Chinese army; the varying composition of gunpowder when used for different purposes—on more than one occasion, he sent Bertin samples for chemical analysis; the metalworking techniques for constructing a type of gong used for military communications and to keep troops in order; and the nature of Chinese military strategy, several classical texts on which he translated into French.<sup>35</sup> Amiot also described in considerable detail the course of various Chinese military campaigns. Although his accounts may be inaccurate in certain points of detail, overall they are corroborated by Chinese sources; they probably reflect information then current at court, obtained from persons in whose access to knowledge and the corridors of power he expressed great confidence.<sup>36</sup> These accounts seem to have been intended to show the Qing armies in a favorable light, but on at least one occasion Amiot infuriated an anonymous European friend of Bertin's, by justifying what the friend considered to be the completely dishonorable and barbaric Qing treatment of captured rebels.<sup>37</sup>

<sup>34</sup> Sun Xingyan, *Sun Zi Shi Jia Zhu* (n.p., 1855, orig. date of publication not given); Xu Xuefan, "Wu Bei Ji Yao," in Xu Naizhao, comp., *Min Guo Zhai Qi Zhong* (Guangzhou, 1832). On Zhao Xuemin, see Needham, *Science and Civilization*, vol. 5, part 7, 139–41. On scholarly communication during the late eighteenth century, see Elman, *From Philosophy to Philology*, esp. 172–229.

<sup>35</sup> For Amiot's partial description of Chinese military organization, which he took from "a military almanac published four times a year," see Amiot to Bertin, July 28, 1777, Bib. Inst. 1515, 119; for his discussions of the composition of gunpowder (which suggest he grasped the greater sophistication of Chinese knowledge), see his letters to Bertin of July 15 and November 5, 1778, Bib. Inst. 1515, 214, 220. For his translation of classical texts on strategy, including Sun Zi's *Art of War*, see his "Art militaire de la Chine," in *Mémoires concernant l'histoire, les sciences, les arts, les moeurs, les usages, &c. des Chinois: Par les missionnaires de Pékin* (Paris, 1777–1814), vol. 7; "Supplément," vol. 8. Amiot's "Art militaire" had already been published separately in Paris by Didot in 1772; it was accompanied by dozens of sketches of Chinese crossbows and cannon, siege weapons, armor, and warships. Despite its flaws, the translation of *Art of War* became a classic in its own right in France. For an assessment of Amiot's translation and its reception, see Sun Tzu, *The Art of War*, Samuel B. Griffith, trans. (Oxford, 1971), 179–82.

<sup>36</sup> See October 5, 1771 (on the Burma campaign), Bib. Inst. 1515, 10; September 12, 1776 (on the Second Jinchuan War), Bib. Inst. 1515, 73 and following; August 17, 1781 (on the Hezhou Muslim uprising), Bib. Inst. 1516, 276–77; July 1, 1788 (on the Taiwan campaign), Bib. Inst. 1517, 35. Some of these accounts were published in various editions of the *LEC* or in the 17-volume *Mémoires* cited in note 35.

<sup>37</sup> Bertin to Amiot, November 30, 1777, Bib. Inst. 1522, 154: "le général est un perfide et son maître un cannibale" (emphasis in original).

Amiot also attempted to give the Chinese helpful hints of a military nature. Recognizing the military potential of hot air balloons, then causing a sensation in Europe, he struggled to arouse Chinese interest in them but failed (despite some princely interest) because of the great expense involved.<sup>38</sup> A prince's assurance that "only in war do we have no regard for expense, difficulty or danger; we are ready to try anything" was borne out by other late eighteenth-century Jesuit correspondence.<sup>39</sup> For example, in 1772, noting that the emperor believed that the missionaries in his service knew "something of everything," one of their number reported that the emperor sometimes ordered him and his colleagues to assist at artillery practice or to explain how to use the European arms sent north by Chinese officials based in Canton. Recently chastised by his superiors in Rome for "teaching the infidel the art of war" by developing a plan for the fortification of Beijing, this correspondent also asserted that he and his colleagues had responded to imperial inquiries by denying all knowledge of the techniques required for casting artillery.<sup>40</sup>

The latter assertion was, however, less than forthright, for soon afterward a Jesuit missionary went to the battlefield of a tenacious rebellion specifically to advise on casting and using artillery. During the Second Jinchuan War (1771–1776), native tribespeople in western Sichuan ensconced in a mountainous area had taken refuge in high stone fortresses (*diao*) that the Qing were unable to destroy without bombardment.<sup>41</sup> The precipitous terrain forced soldiers to move in single file and on foot; there was no question of transporting heavy artillery. To some extent, this problem was resolved by the expedient of carrying thousands of metal ingots that could be forged into cannon when and where needed by artisans attached to the army, a solution adopted elsewhere and in earlier times by Turks

<sup>38</sup> On Amiot's enthusiasm for the "globe aërostatique," see his letter of October 20, 1784 addressed to supercargo Roze at Canton; clearly, Roze had sent Amiot details that whetted the latter's appetite for this new mode of transportation. Archives des Jésuites de Paris, Fonds Vivier, vol. 1, 5. "The first use that I will make of it is to go to Canton to see more Frenchmen than I have seen in all the thirty-three years that I have been here." On his failure to interest the Chinese, see Amiot to Bertin, October 10, 1789, Bib. Inst. 1517, 85; see also Bertin to Amiot, December 20, 1787, Bib. Inst. 1524. There was some disagreement at court over the advisability of informing the emperor about hot air balloons: Cordier, "Les correspondants de Bertin," 245–56, letter from the Lazarist Father Nicolas Raux, November 27, 1786. A few years later, a member of Macartney's embassy actually went up in a balloon while in Beijing, but even this seemed not to interest the Chinese. J. L. Cranmer-Byng, ed., *An Embassy to China: Being the Journal Kept by Lord Macartney during His Embassy to the Emperor Ch'ien-lung, 1793–1794* (London, 1962), 54.

<sup>39</sup> Letter to Bertin, July 1, 1788, Bib. Inst. 1517, 52. The prince was "a grandson of Kangxi" but cannot at present be identified with any certainty.

<sup>40</sup> ARSI, Jap. Sin., vol. 184, fols. 261–62; Jean-Mathieu de Ventavon [1735–87] to Father Imbert, S.J., Rome, November 4, 1772. See also Pfister, *Notices biographiques et bibliographiques*, 914, citing an unpublished letter of François Bourgeois [1723–92], October 30, 1769, located in the Xujiawei library near Shanghai. On papal prohibitions on transmitting "the art of war" to Muslims and other "infidels," see Boxer, "Asian Potentates and European Artillery," esp. 160–61.

<sup>41</sup> The main Chinese accounts of the war are *Qinding Pingding Liang Jinchuan Fanglüe* [Imperial Authorized Account of the Suppression of the Two Jinchuan], Wang Chang, et al., comp., 7 vols. (1800; rpt. edn., Beijing, 1985); Nayancheng, *A Wencheng Gong Nianpu*, juan 6–17; Wei Yuan, *Sheng Wu Ji* [Record of Sacred Military (Achievements)] (1842; rpt. edn., Beijing, 1984), juan 4; Zhao Yi, *Huangchao Wugong Jisheng* [Record of the Military Achievements of This August Dynasty] (n.p., n.d.; rpt. edn., 1877); see also Erich Haenisch, "Die Eroberung des Goldstromlandes in Ost-Tibet," *Asia Major*, 10 (1935): 262–313.

and Persians confronting similar logistical difficulties.<sup>42</sup> But these cannon tended to explode after two or three days of heavy firing, which, obviously, limited their usefulness as well as often killing or wounding artillerymen. Moreover, it was virtually impossible to keep the army at the front provided with sufficient raw metal, despite efforts to melt down and reuse exploded cannon barrels.<sup>43</sup> Further problems were caused by the Qing forces' unfamiliarity with the siege methods needed. The Chinese had for centuries been fortifying entire towns with massive walls and were quite familiar with the concept of siege warfare, but the traditional means of ending a siege were mining, mass assault, or blockade, none of which was feasible in this case because of the mountainous terrain.<sup>44</sup> Furthermore, Chinese city walls generally were made of tamped earth rather than of the stone that confronted the Qing armies in western Sichuan.

In 1774, in response to these difficulties, the emperor ordered the Portuguese Jesuit Felix da Rocha (1731–1781) to proceed to the front, bearing with him designs for mortars (*chongtianpao*), or “guns for attacking heaven” (popularly known as “watermelon guns” [*xiguapao*] because of their bulbous shape). The emperor made no pretense: the purpose was to increase the accuracy of his army's artillery.<sup>45</sup> Most likely, the designs in question were those made by Verbiest a century earlier, for these had been republished only a few years before, with illustrations of individual weapons accompanied by specifications and by reproductions of the inscriptions, including the names of artisans and supervisors involved in the actual work of cannon founding.<sup>46</sup>

Although the Chinese sources state unambiguously the purpose for which da Rocha was sent to the front in 1774, the same cannot be said for the Jesuit descriptions of the Jinchuan campaign, written for European consumption. If

<sup>42</sup> Amiot to Bertin, September 12, 1776, Bib. Inst. 1515, 73. See also *Mémoires . . . des Chinois*, 3: 387–412. See Cipolla, *European Expansion*, on the construction of cannon outside the walls of Constantinople; and Robert D. McChesney, “An Untitled History of the War for Khurasan, 1587–1598” (New York, n.d.), 38, on similar activities outside Herat in the late sixteenth century.

<sup>43</sup> On the difficulty of maintaining the supply of raw materials and artisans for artillery production at this time, see the secret reports submitted to the emperor by the governor-general of Sichuan in *Gongzhongdang Qianlongchao Zouzhe* [Secret Palace Memorials of the Qianlong Reign] (Taipei, 1982–92), vol. 36, 69, 39/7/13 (August 19, 1774); vol. 36, 651, 39/9/12 (October 16, 1774); vol. 37, 21–22, 39/9/26 (October 30, 1774).

<sup>44</sup> See Parker, *Military Revolution*, 143–44.

<sup>45</sup> More than one edict expressed the emperor's intention; see Nayancheng, *A Wencheng Gong Nianpu*, 12, 22b–24a, n.d. This document does not refer specifically to Westerners or to any individual missionary, and it may be that the decision to send a Western “surveyor” was made only later; *Daqing Gaozong Shilu*, juan 962, 16a–b, 39/7/9; also in Fu Lo-shu, trans., *A Documentary Chronicle of Sino-Western Relations*, 2 vols. (Tucson, Ariz., 1966), 273–74. For an illustration of a *chongtianpao*, see *Huangchao Liqi Tushi* [Illustrations and Plans of Ceremonial Instruments of Our August Dynasty] (n.p., n.d., preface, 1766), 16, 14a; see also Needham, *Science and Civilization*, vol. 5, part 7, 475. This type of mortar apparently was among the gifts made by the British to the emperor in 1793; Fu, *Documentary Chronicle*, 561, n. 468.

<sup>46</sup> For examples of Verbiest's designs, see *Huangchao Liqi Tushi*, 9a–b, 16a–b. This text was compiled under the auspices of Fulong'an (1743–84), the senior official at court who had particular responsibility for the Jesuits. Among those who had worked on the project were He Guozong (d. 1766), a senior mathematician closely associated with a number of Jesuits at court, including da Rocha, who had participated in He's survey of Xinjiang in the 1750s (see below), and a Manchu named Debao, who may have been the same man who accompanied da Rocha to the Jinchuan front or may have been an eponymous and much more distinguished civil official who lived from 1719 to 1789. On the cannon designs, see Shu, Hu, and Zhou, “Nan Huairen yu Zhongguo Qingdai zhuzao de dabao,” 28, citing the Imperial Household Archives.

they mention da Rocha at all, they say only that the emperor sent him to the front that year "pour lever la carte"—to take measurements for a general survey of the area. This claim was plausible since da Rocha had, with a colleague, earlier surveyed the newly conquered region of Xinjiang for the emperor, traveling there even before that war was over.<sup>47</sup> The maps they had produced were kept in the palace; so far as can be ascertained from Chinese and European sources, neither missionary played any other role in the conquest of Xinjiang.<sup>48</sup>

The Chinese and Jesuit sources also differ in their versions of what happened when da Rocha reached the front in October 1774. The Jesuits claimed that da Rocha was so exhausted and unwell that he returned to Beijing without accomplishing his mission.<sup>49</sup> The correspondence between the emperor and commander-in-chief Agui tells a different story. Agui was one of the most powerful men of his time, a Manchu of sufficient scholarly attainment to pass through at least some levels of the civil service examinations. By 1773, he had already held senior military and civilian positions all over the empire; first appointed in 1763 to the Grand Council, the emperor's closest advisory group, he was its senior member from 1780 until his death in 1797 and hence was for almost two decades the ranking official in the entire empire. In his 1774 reports to Qianlong, Agui noted that da Rocha and his escort, a captain of the imperial bodyguard named Debao, had announced that the emperor had sent them because earlier calculations concerning the mortars had been inexact. After da Rocha made various measurements, relating mainly to the angle of firing (just as Verbiest had discussed in his treatise), the margin of error was sharply narrowed, and bombardment of the rebel fortresses became considerably more effective; it was a decisive factor in the eventual Qing victory. Moreover, shortly after da Rocha's arrival, new artillery began to be cast, based presumably on the designs he brought with him and possibly produced under his actual supervision.<sup>50</sup> In short, the Chinese sources reveal that da Rocha was indeed directly involved in "teaching the infidel the art of war."

<sup>47</sup> On Qianlong's personal involvement in the selection of da Rocha for this assignment, see ARSI, Fondo Gesuitico, 722, 3d folder, item 7 (*littera annua* 1756).

<sup>48</sup> ARSI, Jap. Sin., 98, pp. 46 (n.d. [1756–57]); 56 (n.d. [1758]); 62b–63a (November 28, 1758). Some missionaries criticized da Rocha in this context: see Jap. Sin., 98, p. 52, February 7, 1758; see also Jap. Sin., 181, 252–53, December 2, 1752, cited by Krahl, *China Missions in Crisis*, 68. For da Rocha's survey work in Manchuria, see LEC, 13: 439 (1773). See also Bernard, "Les étapes de la cartographie scientifique," 472, citing J. Brucker, "Positions géographiques déterminées par les missionnaires jésuites dans le Turkestan oriental et la Dzoungarie en 1756 d'après deux lettres inédites des PP. Amiot et Gaubil," *Bulletin de la Société de Géographie de Lyon* (November 1880), published separately, 7–8; Semans, "Mapping the Unknown." On the Xinjiang campaigns, see *Qinding Pingding Zhunke'er Fanglüe* [Imperially Authorized Account of the Suppression of the Zunghars], Fuheng, comp. (n.p., 1772).

<sup>49</sup> LEC, 13: 491–504, at 497, letter, n.d. [1777]; this document seems to be much the same as Bourgeois' account of the campaign, "Relation de la Révolte du Pays des Miao-tse," *Mémoires . . . des Chinois*, 3: 412–22, in which the same information about da Rocha appears at 415–16. See also Amiot's long letter to Bertin about the Jinchuan campaign, September 12, 1776, Bib. Inst. 1515, 73 and following, also in *Mémoires . . . des Chinois*, 3: 387–412, and its unattributed supplement, *Mémoires . . . des Chinois*, 3: 412–22.

<sup>50</sup> Nayancheng, *A Wencheng Gong Nianpu* 12, 18a. The dates of these documents are somewhat confused. According to an undated memorial, Debao and da Rocha arrived on the 18th day of the 9th month (October 22, 1774) and proceeded to a test firing of the old cannon on the same day. The document reporting the casting of a new cannon follows this account in the text but is dated the 15th.

The Jesuit authors of the accounts of the war must have known of da Rocha's direct involvement in improving artillery effectiveness; we can only speculate about their motives in glossing over it. Doubtless aware of the criticisms leveled against Verbiest for his cannon foundry a century earlier, and of the more recent strictures against offering military advice, they may well have tacitly agreed to avoid jeopardizing their already precarious position by revealing what da Rocha had done. Perhaps the need for solidarity in adversity outweighed the antagonisms among the missionaries. This lack of candor, however, inevitably raises questions about the reliability of all Jesuit sources transmitted from China during this period.

Da Rocha visited the Jinchuan region again in 1777 to survey the newly pacified area for his Chinese masters. This time, it seems that he accomplished the task and also took advantage of the prestige with which he was invested by the imperial commission to secure the release of a colleague who for years had languished in a Sichuan prison.<sup>51</sup> His map of the Jinchuan region, said at the time to have been made for the official campaign history (*Qinding Pingding Liang Jinchuan Fanglüe*), was not included in that official text; archivists at the First Historical Archives in Beijing now report that it is located in their collection.<sup>52</sup>

The sequestering of this and other maps such as the Xinjiang surveys brings up the issue of how widely acknowledged da Rocha's military work was in China. Although it may not have been actually concealed, it is also unlikely to have been actively broadcast; as Qing confidence ebbed during the last quarter of the eighteenth century, in considerable part as the result of a dawning recognition of some of the consequences of extraordinary population growth, the reluctance to acknowledge any degree of dependence on foreign advice and assistance undoubtedly intensified. We have only one source, Agui's report, for da Rocha's assistance with artillery; the emperor's expressions of intent to obtain such aid do not establish that da Rocha provided it. Quite apart from Jesuit discretion on the subject in their published correspondence, none of the official Chinese accounts of the war, such as the campaign history, mentions da Rocha's presence at the front, nor do privately published descriptions of the war, written by such well-known scholars as Zhao Yi (1727–1814) and Wei Yuan (1794–1856), contain any reference to Western aid.<sup>53</sup> Given the relatively primitive state of unofficial communications in China at this time, it is probably safe to assume that the Jesuit's advice and assistance was not general knowledge, although the pervasiveness of gossip and rumor should not be underestimated.

<sup>51</sup> LEC, 13: 521–25.

<sup>52</sup> See *Gongzhongdang Qianlongchao Zouzhe*, vol. 38, 188, QL 42/3/24, a memorial noting that da Rocha ("Fu Zuolin") had gone to the front to survey the area for the official history (*fanglüe*). Information on the probable present whereabouts and possible non-Chinese origins of da Rocha's Jinchuan map was communicated to the author in person by Ju Deyuan, formerly head of research at the First National Archives in Beijing and a specialist on Jesuits in eighteenth-century China; maps of sensitive areas, such as the Tibetan borderlands here in question, are frequently unavailable to foreign researchers in China. An undated and unattributed map of part of the Jinchuan region that is now in the Bibliothèque Nationale is thought by some scholars to relate to the campaign that ended in 1776. The authorship appears Chinese, although possibly the map represents a copy or outgrowth of da Rocha's work. This map was purchased by the Bibliothèque Nationale from the Klaproth collection.

<sup>53</sup> See references to Chinese sources cited in note 41.

THIS CONTROL OVER THE FLOW OF INFORMATION made it possible for the emperor to issue his famous statement. Both domestically and internationally, there was considerable propaganda value to be gained from declaring China's self-sufficiency to a foreign state whose potential menace against Chinese national security prompted the Qianlong emperor to warn his officials in Canton about England's naval and mercantile strength. This emperor, with his pretensions to universal monarchy, was hardly likely to admit openly to the representative of a foreign ruler an interest that, in Chinese minds, could be unfavorably interpreted as an intimation of inferiority. The imperial declaration may well also have been subtly intended to remind Qianlong's Chinese subjects that their Manchu rulers remained faithful to the traditional public Chinese attitude of superiority toward foreigners. Although members of the Macartney embassy disparaged what seemed to them to be Chinese disdain for the gifts they brought, those whom they encountered may well have simply been taking their lead from the emperor.<sup>54</sup>

There were other reasons for the ostensible Chinese indifference to the official gifts of their Western visitors, an attitude in apparent conflict with their enthusiasm for what missionaries could provide. First, while it was clear to the Chinese that the missionaries, men of different nationalities divided by internal disputes, were not acting as representatives of their countries (despite efforts on the part of Amiot and the French to assert their close relationship to the French throne), the Macartney embassy unmistakably represented a single foreign ruler. The emperor and his officials understood this distinction, even though their unfamiliarity with Western diplomatic practices probably prevented their grasping the full implications of the embassy.<sup>55</sup> Second, it was obvious that the effective control exercised over Europeans serving at the Qing court could not be duplicated in the case of the Macartney embassy. Thus, whatever their true beliefs, an appearance of condescension was preferable to a display of curiosity.

Third, the involvement of Agui in the 1774 episode drew the entire issue into the intensely factionalized world of late eighteenth-century Chinese politics. Agui participated in a number of the major military campaigns of the middle and later eighteenth century, but it was the Jinchuan war, in which da Rocha's advice had rescued Agui's faltering campaign, that made his reputation; Agui soon became a central figure in one major political faction. Much admired by the Jesuits, he was said to be deeply intrigued by Western knowledge, and it is reasonable to attribute his interest at least partly to his wartime experience. The other main faction at court clustered around Heshen (1750–1795), the imperial favorite and the man in charge of embassy liaison in 1793. Heshen had little experience and absolutely no aptitude for military affairs: on Heshen's only, disastrous, military venture, Agui, arriving at the crucial moment, saved his life and subsequently put in a good word for him with the emperor. Heshen offset the potential political disadvantage of

<sup>54</sup> See Cranmer-Byng, *Embassy to China*, 54.

<sup>55</sup> See James Hevia, "A Multitude of Lords: Qing Court Ritual and the Macartney Embassy of 1793," *Late Imperial China*, 10 (December 1990): 72–105. The fact that, nearly half a century later, the Chinese, almost fatally, failed to realize the importance of such a distinction after the abolition of the East India Company monopoly in 1834 cannot be taken as evidence of a similar failure in 1793. On Qianlong's interest in the different European states and their rulers, see *LEC*, 13: 425–45, n.d.

lacking military qualifications, however, by his close association with one of the most successful of late eighteenth-century generals, Fukang'an (d. 1796). In 1793, Fukang'an had recently returned from Tibet to take up the governor-generalship of Guangdong and Guangxi provinces. That is, he was in the probably unique position of having encountered the British in both places—as unruly traders on the southeast coast and, as he mistakenly suspected, allies of his enemies, the Gurkhas, in Tibet. Thus Fukang'an's experience led him to regard the British as troublemakers. As a result, he was not only extremely and overtly hostile toward them but also actively sought to dissuade Heshen from helping them or promoting their interests in any way.<sup>56</sup> One can speculate that Heshen and his associates, having been persuaded of the undesirability of the British by Fukang'an, sought to convince the emperor to reject the embassy, hoping at the same time to undermine any advantage that might have accrued to Agui and his adherents as the result of Agui's contacts with the missionaries. Although Macartney himself noted how vigorous the eighty-two-year-old emperor was, Heshen's influence may well have played a part in the entire episode.

Europeans were probably aware of Chinese interest in Western technical skills in yet another military context. The Qianlong emperor regarded the military achievements of his reign as one of its crowning glories, and, after the annexation of Xinjiang, he rebuilt a hall for the specific purpose of commemorating military exploits.<sup>57</sup> On its walls hung the portraits of generals and statesmen who had taken part in the campaign, and Qianlong commissioned missionary artists to produce sixteen scenes depicting important battles and memorable events of the war.<sup>58</sup> After the emperor saw some engravings of original battle paintings done by the German painter Rugendas (1666–1742), he decided to have his sixteen paintings engraved in copper.<sup>59</sup> This art had been forgotten in China, and missionaries cooperated with French merchants in Canton to send the pictures to Paris for engraving, where the sinophile Bertin helped arrange for the work to be done by the best craftsmen of the day and for extra copies to be made for the French king and his senior ministers, despite a stipulation of exclusivity for the Chinese. After the engravings were returned to China, they were copied,

<sup>56</sup> Staunton, *Authentic Account*, 3: 11, 53, 143; see also *Daqing Gaozong Shilu*, *juan* 1493, 16b-18b, 60/12/25.

<sup>57</sup> Qianlong personally commemorated his armies' victories in a 1792 essay titled *Shi Quan Ji* [Record of Ten Complete (Victories)]. From this work, he also took as a literary name the appellation "Old Man of the Ten Complete [Victories]" (*Shi Quan Lao Ren*). Arthur W. Hummel, ed., *Eminent Chinese of the Ch'ing Period (1644–1912)*, 2 vols. (Washington, D.C., 1943), 369. See also Zhuang Jifa, *Qing Gaozong Shi Quan Wugong Yanjiu* [An Investigation into the Ten Great Victories of the Qianlong Emperor] (Taipei, 1982).

<sup>58</sup> The saga of the victory pictures has been exhaustively studied by Western scholars: see Paul Pelliot, "Les conquêtes de l'empereur de Chine," *T'oung Pao*, 20 (1921): 180–274; Michèle Pirazzoli t'Serstevens, *Gravures des conquêtes de l'empereur de Chine K'ien-long au musée Guimet* (Paris, 1969); and Hartmut Walravens, *China illustrata: Das europäische Chinaverständnis im Spiegel des 16. bis 18. Jahrhunderts* (Weinheim, 1987), 40–56. See also Hao Zhenhua, "Lang Shining Zhongguo Xiyu Zhantude Shishi ji Yiyi" [The Historical Circumstances and Significance of Castiglione's War Paintings of the Qianlong Emperor's Campaign against the Zunghars in the Northwestern Border Region], *Sino-Western Cultural Relations Journal*, 13 (1991): 18–32.

<sup>59</sup> Qianlong expressed interest in European battle pictures more than once. In conversation with Father Benoist in 1773, he said, "There are a number of European prints that represent [military] victories won by your sovereigns. Who are they defeating, what enemies have they had to fight?" *LEC*, 13: 427.

somewhat less elegantly, by Chinese craftsmen trained in the meantime in the technique of copper engraving by one of the Jesuits.<sup>60</sup> That this exchange played no part in subsequent European judgments of China can probably be explained by the likelihood that the details of this exchange were buried in Paris along with the *ancien régime* and that Frenchmen in China who had helped expedite it had little interest in recalling it as a counterweight to other views.

Political events in Europe were indeed the main reason for the shift in European attitudes toward China. In the earliest phases of Sino-Western interaction, Jesuit missionaries were virtually the sole interpreters of China to Europe. Because they generally wished to gain credit by conveying the civilized nature of the millions they expected to convert to Christianity, their accounts tended to be strongly approbatory. During the course of the eighteenth century, however, the steady decline of the once-powerful Society of Jesus, culminating in the order's formal abolition in 1773, radically undermined Jesuit credibility and prompted a new wariness among missionaries regarding what they chose to report. At the same time, the trend toward secularization in Europe was matched by the eclipse of the Jesuit monopoly on information. Various embassies, merchants, and travelers began to visit China and to broadcast opinions that were often quite unfavorable, in part because of China's continuing unwillingness to welcome foreigners except on its own terms.

But Chinese restrictions were not the only or even the primary reason that Western descriptions of China grew increasingly adverse. The far-reaching intellectual and political developments of the eighteenth century combined with advances in the quest for technological supremacy to exercise a pervasive influence on the European interpretation of other cultures. For example, China's great agrarian accomplishments that the French Physiocrats once vaunted seemed less admirable in a budding industrial age; the restrictive Canton system of trade went directly against the free world market advocated by Adam Smith in 1776, and the absence of political liberty or consensus in China did not sit well with the revolutionaries who dominated the latter part of the century.<sup>61</sup> Finally, the increasing predominance of negative Western attitudes toward other cultures at this time also partly reflected the disdain Westerners felt when they compared the relatively class-bound societies of traditional Asia and Africa with the dynamic social changes of their own postrevolutionary, industrializing societies.<sup>62</sup>

In the late eighteenth century, well before the Western incursion brought a new immediacy to the need for military reform, the Chinese were extremely interested

<sup>60</sup> Subsequent wars were commemorated in victory pictures drawn or engraved in China by Chinese artists and craftsmen. These included the Muslim uprising at Ush in 1765, the Second Jinchuan War of 1771–76, the Vietnam (Annam) campaign of 1788–89, the Taiwan rebellion of 1787–88, the 1792 war in Nepal, the campaigns to suppress the Miao minority in Yunnan and Hunan during the 1790s, the war against Jahangir in Xinjiang in the 1820s, and the Muslim wars of the late nineteenth century. For the identity of the Chinese artists, see Walravens, *China illustrata*, 42; Pirazzoli t'Serstevens, *Gravures des conquêtes de l'empereur de Chine*, 43. On the history of some of the indigenous victory pictures, see also Pelliot, "Les conquêtes," 243–44.

<sup>61</sup> See Jonathan D. Spence, "Western Perceptions of China from the Late Sixteenth Century to the Present," in Paul S. Ropp, ed., *Heritage of China: Contemporary Perspectives on Chinese Civilization* (Berkeley, Calif., 1990), 1–14.

<sup>62</sup> Adas, *Machines as the Measure of Men*, esp. 166–67, 178–79, 195–98. See also McNeill, *Pursuit of Power*, esp. 185–222.

in technological advances and in what the West had to offer. The evidence was readily available to Europeans who chose to grasp it. Yet when in public the Chinese denied such an interest, primarily for reasons of domestic politics, Europeans, similarly influenced by developments at home, took that denial as evidence of an entire mental attitude: ingrained xenophobia and a concomitant resistance to progress. In the Age of Progress, such an attitude led automatically to the assumption that the Chinese were inferior beings.

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