7 • Traditional Chinese Cartography and the Myth of Westernization

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In the preceding chapter I stated that Chinese cartography did not dissociate itself from the visual arts until the nineteenth century. That statement seems to be contradicted by accounts of Chinese mapping in the late Ming (1368–1644) and Qing (1644–1911) dynasties, according to which Chinese cartography assimilated techniques imported from Europe and became a "science" in the Western sense of the word. What this new science of Chinese cartography involved was a conception of the earth as spherical and the use of a coordinate system for locating points on the earth's surface. This entailed the use of mathematical techniques for projecting points on the earth's spherical surface to a plane mapping surface. To judge from previous accounts of Chinese cartography, European cartography so displaced traditional Chinese practices that they disappeared or at least are not worth mentioning. The accounts of late Ming and Qing cartography in works by Wang, Needham, Lu, and others focus on the Jesuit mapping of China.[1] For these historians, small-scale mapping is the measure of all cartography, and so other aspects of cartographic culture are overlooked. Representatives of the earlier tradition are barely mentioned. Accounts like these foster the impression that in the eighteenth century, Chinese and European cartography became indistinguishable.

When European cartography was first introduced into China in the late sixteenth century, the major difference between European and Chinese cartography was that traditional Chinese mapmakers treated the earth as flat. According to previous accounts, that treatment changed after a different world model and Ptolemaic cartographic techniques were brought to China by Jesuit missionaries. Here I examine the Chinese responses to those works, insofar as they were relevant to Chinese cartography. Perhaps lack of response is a better way to describe the situation. For most of the period under discussion, from the late sixteenth century to the beginning of the twentieth, Chinese cartographic practice bears few traces of European influence. The conversion of Chinese cartography to the Ptolemaic system was not as swift or complete as previous accounts have made it seem.

THE INTRODUCTION OF EUROPEAN CARTOGRAPHY

It was not the primary aim of the Jesuits to train the Chinese in European science and technology. In fact, to most Jesuits, even to consider this aim was controversial. The missionaries Alessandro Valignani (1539–1606) and Michele Ruggieri (1543–1607), however, were perceptive enough to see that Sinicization was the only way to secure a foothold in China. Matteo Ricci (1552–1610) followed their line of reasoning, though not without great pressure from his superiors against such a policy. Ricci believed that the way to win Chinese converts to Christianity was through indirect means, rather than by a direct challenge to Chinese values and beliefs. He attempted to win over the intellectual elite by recourse to the scientific achievements of European culture, in mathematics, astronomy, and cartography. Once Chinese intellectuals appreciated the advantages of European science and technology, according to Ricci's line of thought, they might be induced to convert to Christianity. Members of the elite were targeted for attention because the Jesuits saw them as a way to the imperial court. If the emperor could be converted, the rest of the empire would follow. For the Jesuits, then, maps were part of what Jacques Gernet has described as an "enterprise of seduction."[2]

Though scientific aims were not of paramount concern to the Jesuits, their cartographic works had the potential

1. See Wang Yong, *Zhongguo dilixue shi* (History of geography in China) (1938; reprinted Taipei: Shangwu Yinshuguan, 1974); idem, *Zhongguo ditu shi gang* (Brief history of Chinese cartography) (Beijing: Sanlian Shudian, 1958); Joseph Needham, *Science and Civilisation in China* (Cambridge: Cambridge University Press, 1954–), vol. 3, with Wang Ling, *Mathematics and the Sciences of the Heavens and the Earth* (1959); Chen Cheng-siang (Chen Zhengxiang), *Zhongguo dituxue shi* (History of Chinese cartography) (Hong Kong: Shangwu Yinshuguan, 1979); Chen Feiya et al., eds., *Zhongguo gudai dilixue shi* (History of ancient Chinese geography) (Beijing: Kexue Chubanshe, 1984); Lu Liangzhi, *Zhongguo dituxue shi* (History of Chinese cartography) (Beijing: Cehui Chubanshe, 1984).

2. Jacques Gernet, *China and the Christian Impact: A Conflict of Cultures*, trans. Janet Lloyd (Cambridge: Cambridge University Press, 1985), 15.

to effect revolutionary changes in Chinese mapmaking practices. Before 1583, the year Ricci and Ruggieri established a mission at Zhaoqing Prefecture (in present-day Guangdong Province), Chinese mapmakers had used a square grid system as an aid for plotting distance and direction. Through Ricci's maps, however, some mapmakers were introduced to the Ptolemaic system of organizing cartographic space.

On the wall of the mission room at Zhaoqing, according to Ricci's journal, "there was a cosmographical chart of the universe, done with European lettering. The more learned among the Chinese admired it very much and, when they were told that it was both a view and a description of the entire world, they became greatly interested in seeing the same thing done in Chinese."[3] At the request of the prefect of Zhaoqing, Ricci made the map "speak Chinese," drawing a new version: "The new chart was made on a larger scale than the original, so as to give more room for the Chinese written characters which are somewhat larger than our own."[4] Ricci seems to have recognized that traditional Chinese maps were characterized by textual supplementation, since it is recorded that "new annotations were also added, more in keeping with the Chinese genius."[5] The new map was printed in 1584 as the *Yudi shanhai quantu* (Complete geographic map of the mountains and streams). No examples of this edition are extant, but a rendition of it survives in the *Tushu bian* (Compilation of illustrations and writings), compiled by Zhang Huang (1527–1608), who met Ricci in 1595.

If Zhang Huang's rendition (fig. 7.1) can serve as an indication, Ricci's map was based on a map of the Ortelius type, oriented with north at the top. It defined geographic space by a graticule of longitude and latitude lines. The equator is distinguished from other parallels by its thickness; there is no clear indication of a prime meridian, though the map's center lies somewhere in the Pacific Ocean. The Ming empire is erroneously represented as comprising two large islands and part of the larger Asian continent. This image, however, was improved in later editions, in the sense that the whole empire was depicted as occupying part of the Asian continent (see, for example, fig. 7.2).

Ricci's map, if accepted as true, called for some alterations in Chinese worldviews. The conception of the world as round went against a school of cosmographic thought according to which the world was square and had a generally flat surface. According to Ricci's journal, the Chinese "could not comprehend the demonstrations proving that the earth is a globe, made up of land and water, and that a globe of its very nature has neither beginning nor end."[6] Thus, much Chinese mapmaking had proceeded on the assumption that details on one plane, the earth, were being transferred to another plane, the surface on which the mapmaker would plot them. There would be no real distortion: the transfer process was a matter of reducing the real world to fit on a page or scroll. There was no need to devise mathematical formulas to compensate for the earth's curvature; attention to distance and direction were all that were necessary to locate physical features correctly. The proportions could be scaled down with the square grid.

The graticule on Ricci's map would not have been entirely incomprehensible to Chinese intellectuals. It had an analogue in the twenty-eight *xiu* (lunar lodges) of Chinese astronomy, used to determine positions of celestial phenomena. It was this symmetry with the Chinese celestial system that attracted the attention of some Chinese intellectuals and helped convince them of the map's truth. Feng Yingjing (1555–1606), for example, wrote in a preface to the fourth edition of Ricci's world map (1603): "It fixes the surface of the terrestrial sphere by means of the degrees of the celestial sphere; by means of the trajectory of the sun it differentiates the cold zones from the warm zones; it fixes the confines (of the world) by means of the Five Great Continents, and adds to them the specialities of products and the singularities of customs of peoples. What a nice thing!"[7]

Perhaps more difficult to accept was the representation of China as one small country among many in a world covered mostly by water, not land. The great distances that were depicted on the world map and that the Jesuits claimed to have traveled were interpreted as attempts to deceive. One Ming official wrote: "In past years he [Alphonse Vagnoni (1566–1640), Jesuit missionary] and his colleagues claimed to practice Catholicism, but actually deceived the king of Lüsong [Philippines], seized his land, and changed its name to Daxiyang [which Ricci identified as his homeland]. Thus Min [present-day Fujian] and Ao [present-day Guangdong] are close to a shrewd, savage country. How could it [Daxiyang] be 80,000 *li* away?"[8] Another contemporary writer feared

3. *China in the Sixteenth Century: The Journals of Matthew Ricci, 1583–1610*, trans. Louis J. Gallagher from the Latin version of Nicolas Trigault (New York: Random House, 1953), 165–66. Trigault, a Jesuit missionary in China, translated and added to Ricci's own account of his activities. Trigault's translation was originally published in 1615.

4. *China in the Sixteenth Century*, 166 (note 3).

5. *China in the Sixteenth Century*, 166 (note 3).

6. *China in the Sixteenth Century*, 167 (note 3).

7. The text and translation of this preface may be found in Pasquale M. d'Elia, "Recent Discoveries and New Studies (1938–1960) of the World Map in Chinese of Father Matteo Ricci SJ," *Monumenta Serica* 20 (1961): 82–164, esp. 129.

8. Shen Que (d. 1624), appointed in 1615 as vice minister of rites in Nanjing, quoted in Zhang Weihua, *Ming shi Ouzhou si guo zhuan zhushi* (Commentary on the chapters on four European countries in the *History of the Ming*) (1934; reprinted Shanghai: Shanghai Guji Chubanshe, 1982), 131.

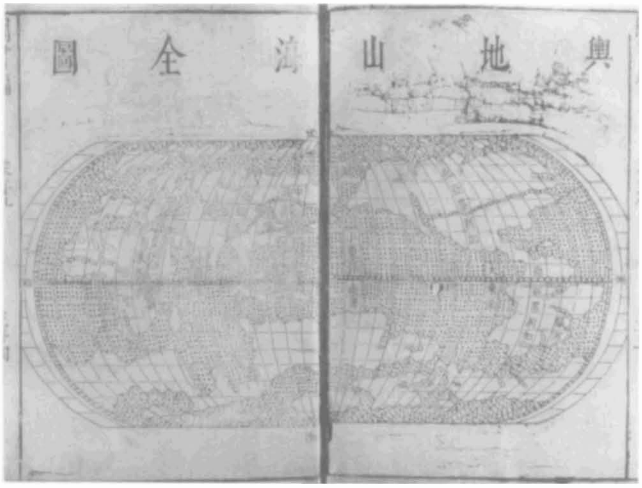


FIG. 7.1. "YUDI SHANHAI QUANTU" (COMPLETE GEOGRAPHIC MAP OF THE MOUNTAINS AND SEAS). A Chinese rendition of the first edition of Matteo Ricci's world map (1584).
Size of each page: 23 × 14.5 cm. From Zhang Huang, comp., *Tushu bian* (1613), 29.33b–34a. Reproduced courtesy of the Harvard-Yenching Library, Harvard University, Cambridge.

that the same tactic used in the Philippines might be applied to China: "When these foreigners claim to have come from 90,000 *li*, the distance claimed is meant to induce us to believe that they have no ulterior motives, so that we will not worry about their swallowing us up."[9]

One feature often remarked on Ricci's world maps is the placement of China near the center. Trigault's version of Ricci's diary asserts that this was a concession to the traditional Chinese belief that China was the center of the world: the Chinese "firmly believe that their empire is right in the middle of it," and they dislike "the idea of our geographies pushing their China into one corner of the Orient."[10] According to the projection on Ortelius's map copied by Ricci, the 180° meridian lay near Asia, somewhere in the Pacific Ocean. Ricci adjusted the image so that this meridian rather than the 0° meridian passed through the center of the map. Thus China also appears near the center.

9. Su Jiyu, a late Ming writer, quoted in Zhang, *Ming shi Ouzhou si guo zhuan zhushi*, 131 (note 8).

10. *China in the Sixteenth Century*, 167 (note 3).

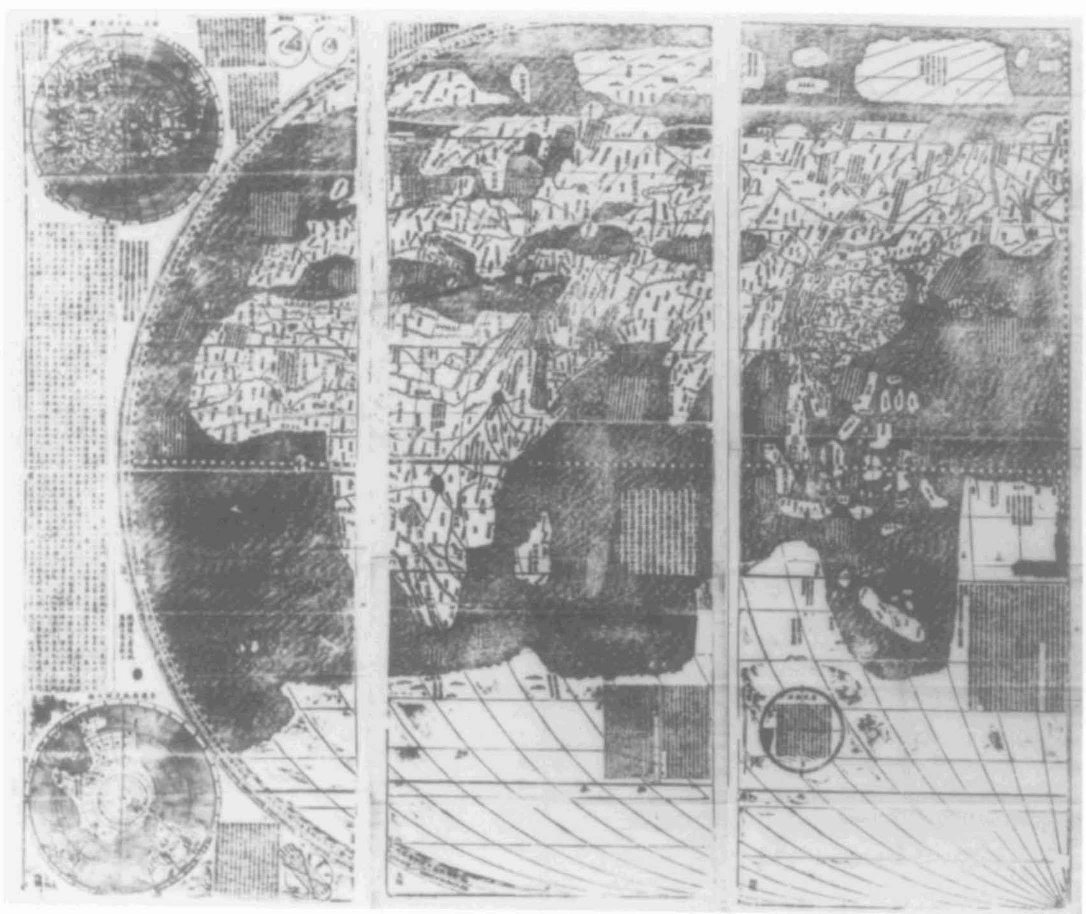


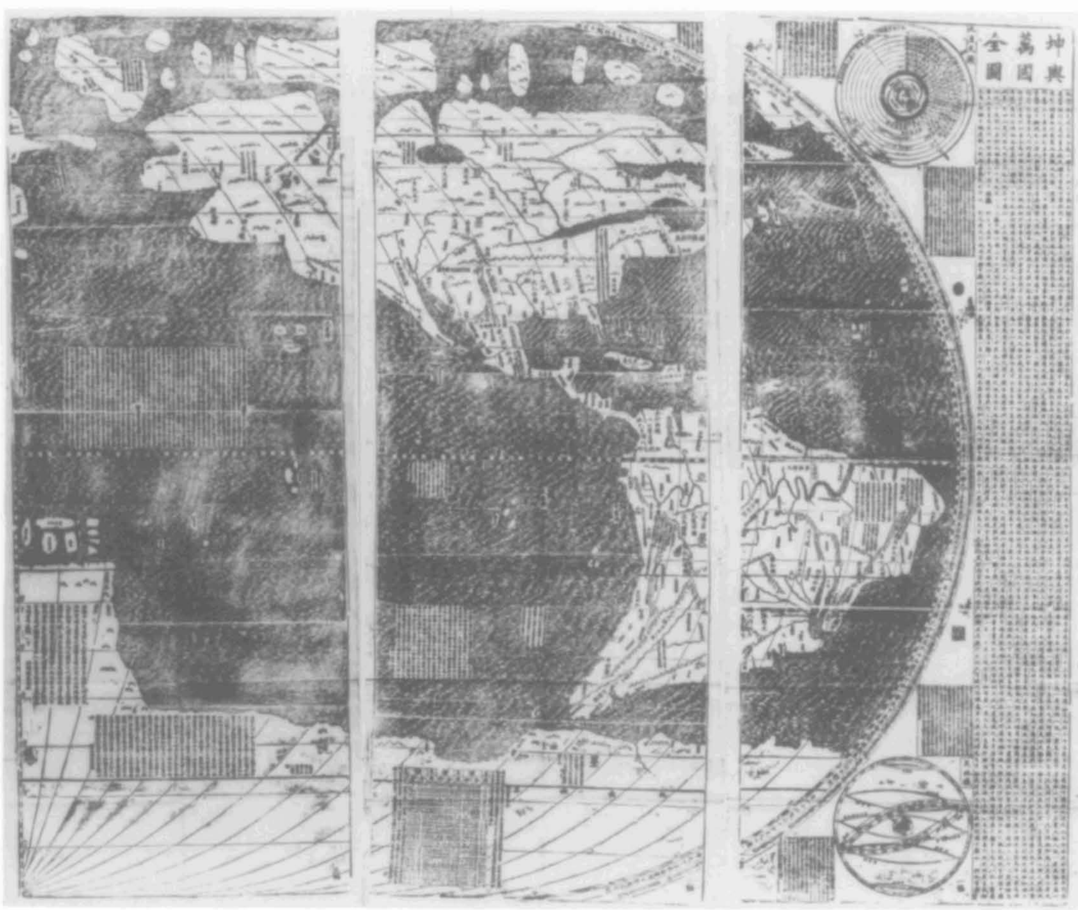
FIG. 7.2. THIRD EDITION OF MATTEO RICCI'S WORLD MAP, 1602.

The idea that this change was made to conform with Chinese conceptions of geographic actuality deserves some scrutiny. The often-quoted Wei Jun (late Ming period), who criticized Ricci for not placing China at the center of the world, does not necessarily reflect prevailing opinion at all levels of Chinese society.[11] The Chinese "Middle Kingdom complex" was somewhat more complicated. For the bureaucratic elite before the seventeenth century, the center of the world may have been near Luoyang at Dengfeng, the site of the great gnomon. But outside those circles there was room for divergent conceptions. One tradition locates the center of the world at the Kunlun Shan (Mount Kunlun), not in China but somewhere to the west. Further evidence appears on Chinese Buddhist maps depicting Jambūdvīpa, in Buddhist cosmology the island continent containing India and surrounding territories. The continent was traditionally represented as an inverted triangle on which China would be a small country to the northeast, not at the center. Chinese Buddhists changed that image, enlarging China, but did not place China at the center (figs. 7.3 and 7.4).

The name "Zhongguo" is often translated as "Middle Kingdom," a name that seems to imply that the Chinese believed their empire was the geographic center of the world. But in its original, quite literal usage, "Zhongguo" referred to the northern Chinese states that were considered the kernel of the Zhou kingdom. It maintained this secondary meaning until the end of imperial China and connoted cultural or political primacy. "Zhongguo" thus does not necessarily imply geographic centrality, but connotes cultural or political centrality.

As a consequence there are several explanations for

11. See, for example, Kenneth Ch'en (Chen Guansheng), "Matteo Ricci's Contribution to, and Influence on, Geographical Knowledge in China," *Journal of the American Oriental Society* 59 (1939): 325–59, esp. 348. Wei Jun is quoted as saying: "China should be in the center of the world, which we can prove by the single fact that we can see the North Star resting at the zenith of the heaven at midnight. How can China be treated like a small unimportant country, and placed slightly to the north as in this map?" Ch'en's article was published in Chinese as "Li Madou dui Zhongguo dilixue zhi gongxian ji qi yingxiang" (Matteo Ricci's contributions to and influence on Chinese geography), *Yu Gong Banyuekan* 5, nos. 3–4 (1936): 51–72.



Size of the original: 168.7 × 380.2 cm. Photograph courtesy of Sotheby's, London.

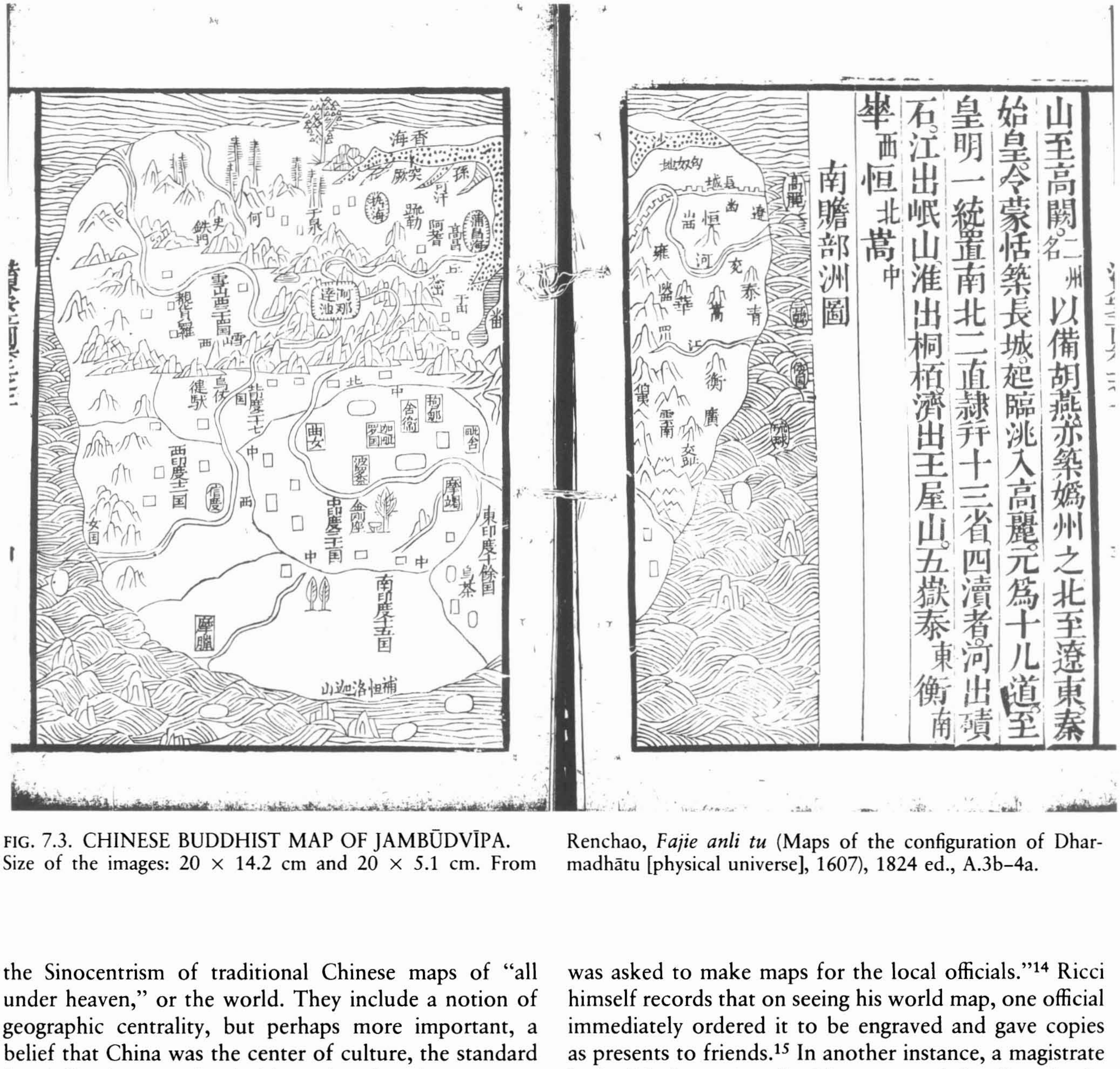


FIG. 7.3. CHINESE BUDDHIST MAP OF JAMBŪDVĪPA. Size of the images: 20 × 14.2 cm and 20 × 5.1 cm. From Renchao, *Fajie anli tu* (Maps of the configuration of Dharmadhātu [physical universe], 1607), 1824 ed., A.3b–4a.

the Sinocentrism of traditional Chinese maps of "all under heaven," or the world. They include a notion of geographic centrality, but perhaps more important, a belief that China was the center of culture, the standard for civilization: peoples desiring cultural attainment gravitated toward China. Although it has been said that "the Chinese are of the opinion that only China among the nations is deserving of admiration,"[12] Ricci's placement of China near the center of his maps could merely reflect the interest his map readers would have had in it.

Previous accounts of the Chinese reception of Ricci's maps have fostered the impression that they enjoyed widespread acceptance in China. For example, Trigault's version of Ricci's journal states that Ricci's map, "frequently revised and refined and often reprinted, found its way into the courts of the Governor and of the Viceroy, where it was greatly admired, and finally into the palace of the King, on his own request."[13] Kenneth Ch'en states: "It appears that no matter where Ricci went he was asked to make maps for the local officials."[14] Ricci himself records that on seeing his world map, one official immediately ordered it to be engraved and gave copies as presents to friends.[15] In another instance, a magistrate had a Ricci map inscribed in stone and distributed rubbings of it to friends. In addition, two of Ricci's closest Chinese friends, Feng Yingjing and Li Zhizao (d. 1630), had copies of Ricci's maps printed from woodblocks.

12. *China in the Sixteenth Century*, 167 (note 3).

13. See *China in the Sixteenth Century*, 168 (note 3).

14. Ch'en, "Matteo Ricci's Contribution," 343 (note 11). For a similar account of the reception of Ricci's maps, see John F. Baddeley, "Father Matteo Ricci's Chinese World-Maps," *Geographical Journal* 50 (1917): 254–70.

15. Matteo Ricci, *Storia dell'introduzione del Cristianesimo in Cina*, 3 vols., ed. Pasquale M. d'Elia, Fonti Ricciane: Documenti Originali concernenti Matteo Ricci e la Storia delle Prime Relazioni tra l'Europa e la Cina (1579–1615) (Rome: Libreria dello Stato, 1942–49), 1:211–12.

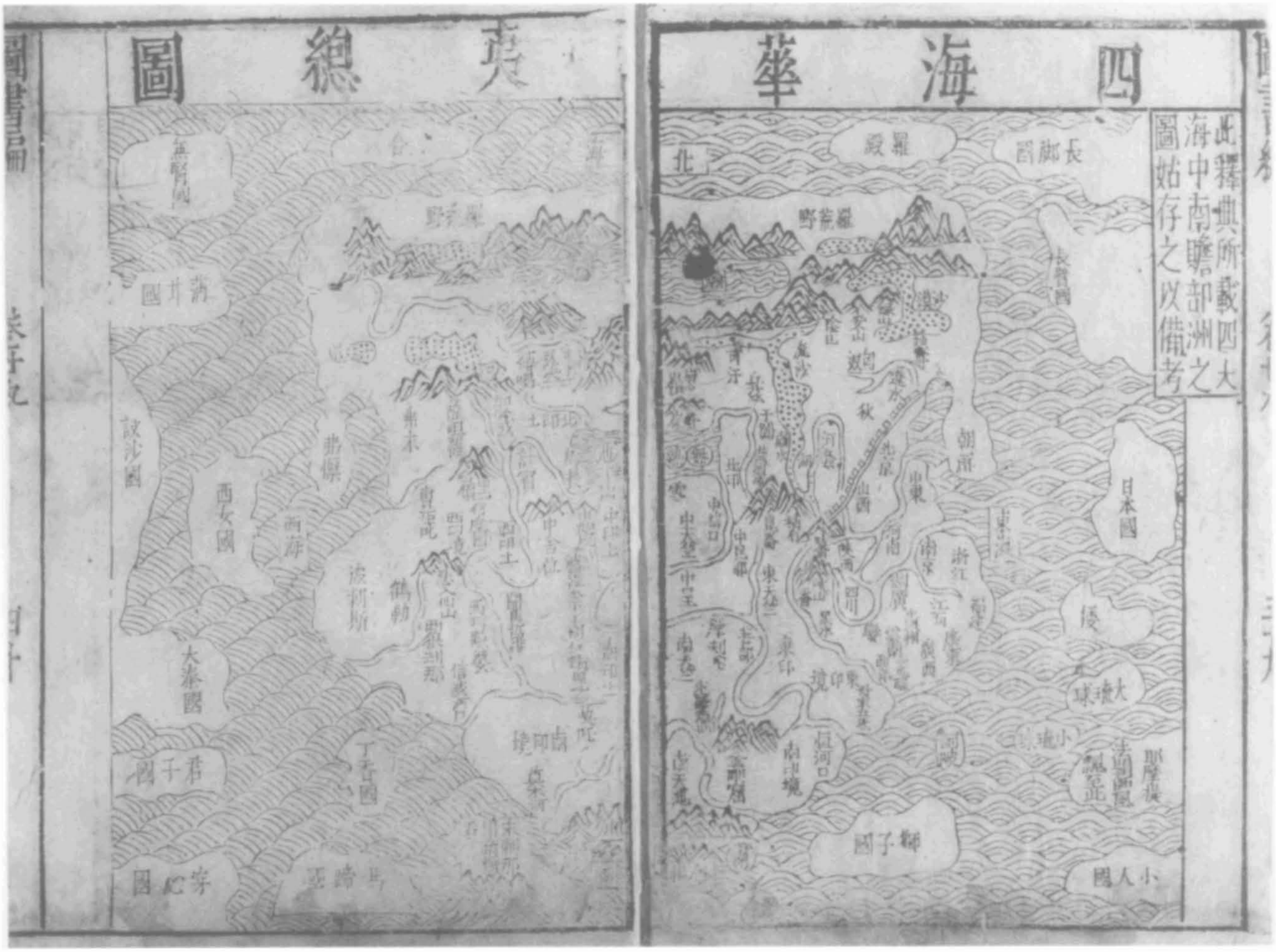


FIG. 7.4. "SIHAI HUA YI ZONGTU" (GENERAL MAP OF CHINESE AND FOREIGN TERRITORY WITHIN THE FOUR SEAS). Another example of a Chinese Buddhist map of Jambūdvīpa (see also fig. 7.3). Size of each page: 22.5 × 14.5 cm. From Zhang Huang, comp., *Tushu bian* (1613), 29.39b–40a. Reproduced courtesy of the Harvard-Yenching Library, Harvard University, Cambridge.

According to Ch'en, several thousand copies of Li's edition were circulated. In 1608 a eunuch showed the emperor a copy of one of Ricci's maps, and the emperor was so impressed that he demanded twelve more copies.[16]

A few scholars thought highly enough of Ricci's maps to include copies of them in their own works. Besides Zhang Huang, already mentioned above, Wang Qi, in the *Sancai tuhui* (Illustrated compendium of the three powers [heaven, earth, man], completed in 1607), reproduces a copy of the second edition of Ricci's map (1600) without the parallels and with only a few place-names (fig. 7.5). Ricci's map of the two hemispheres printed in 1601 was reproduced in Cheng Boer et al., *Fangyu shenglüe* (Compendium of geography, 1612) (fig. 7.6).[17] The maps are accompanied by a list of countries and places with their latitudes and longitudes, and with annotations. In the process of copying, a number of discrepancies in place-names and notes were introduced.

The images in the *Fangyu shenglüe* in turn served as the basis for the world map included in the later *Yutu beikao* (Complete study of maps, compiled ca. 1630) by Pan Guangzu. The *Yutu beikao* begins with a section of maps. The first two are the maps showing the Eastern and Western hemipheres copied from the *Fangyu shenglüe*. Most of the remaining twenty-three maps are based on the maps in the *Guang yutu* (Enlarged terrestrial atlas, ca. 1555) by Luo Hongxian (1504–64) but do not include the square cartographic grid. Pan Guangzu seems to have made no attempt to reinterpret native materials according

16. Ricci, *Introduzione del Cristianesimo*, 2:472–74 (note 15).

17. For a study of the *Fangyu shenglüe*, see Chen Guansheng (Kenneth Ch'en), "*Fangyu shenglüe* zhong geguo dufen biao zhi jiaoding" (Edited table of geographic coordinates for various countries in the *Fangyu shenglüe*), *Yu Gong Banyuekan* 5, nos. 3–4 (1936): 165–94.

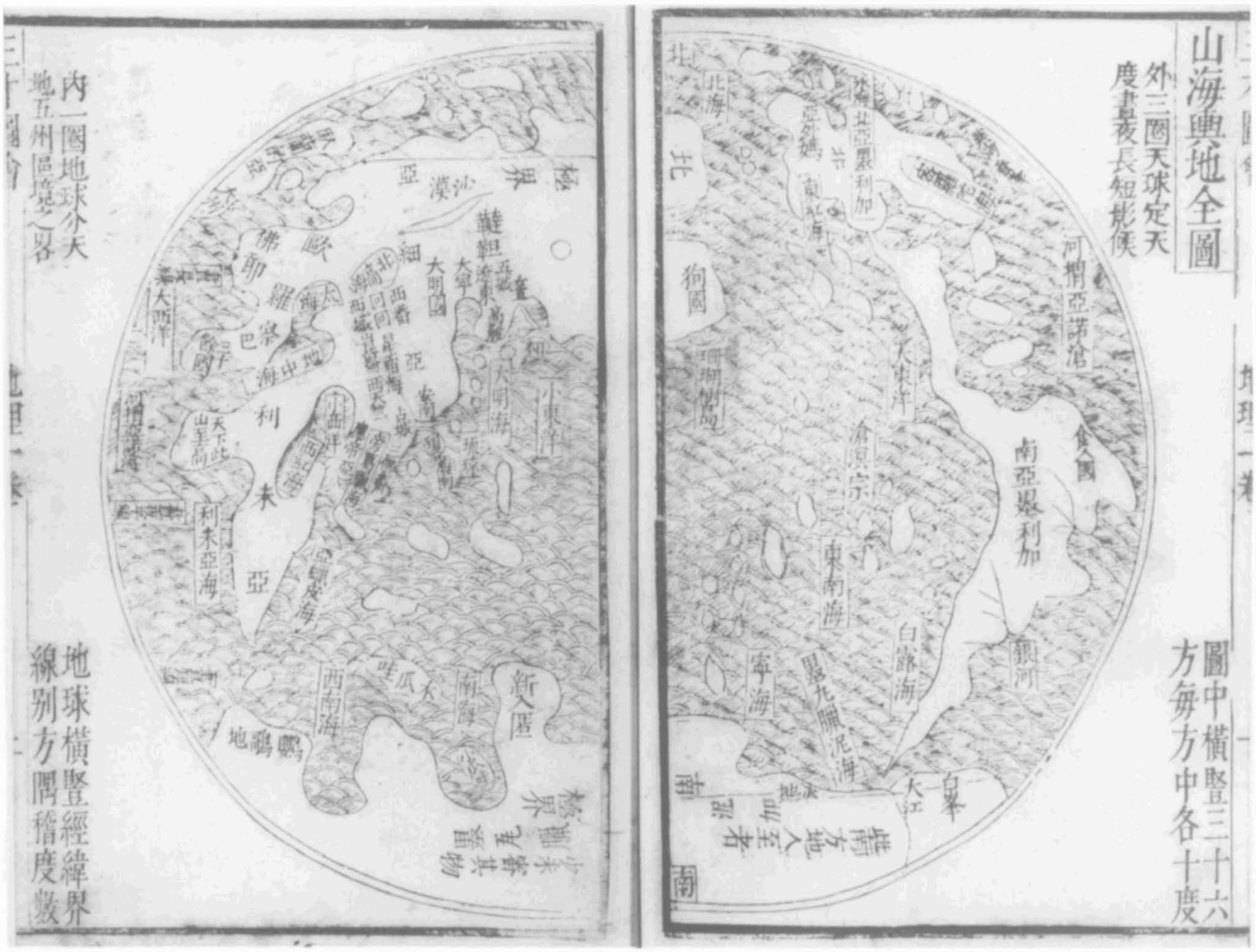


FIG. 7.5. "SHANHAI YUDI QUANTU" (COMPLETE GEOGRAPHIC MAP OF THE MOUNTAINS AND SEAS). A Chinese rendition of the second edition of Matteo Ricci's world map (1602). Size of each page: 21 × 14 cm. From Wang Qi, comp., *Sancai tuhui* (completed 1607, printed 1609), *dili* 1.1b–2a. Reproduced courtesy of the Harvard-Yenching Library, Harvard University, Cambridge.

to European techniques, so it seems doubtful that he really understood them.[18]

Since Ricci's maps had a fairly wide circulation in original editions and reproductions in Chinese works, one of the major questions for historians of cartography has been why they made no lasting impression on Chinese mapmaking. Ch'en offers four reasons: Chinese complacency—a belief that they had nothing to learn from the West; the connection of the world maps with the Catholic religion, which a few years after Ricci's death in 1610 became the object of persecution; the undeveloped state of Chinese science; and careless reproduction by Chinese copyists.[19]

Certainly the information about China reflected in indigenous maps was more reliable than the image presented in the first edition of Ricci's world map. China, as represented in Zhang's rendition of Ricci's map, consists of a section joined to the Asian landmass and two contiguous islands—a representation reflecting the incompleteness of European knowledge of China. Using Chinese maps and geographic works, including the *Guang yutu*, Ricci was able to provide Europeans with more reliable geographic information on China, and the fruits of his research showed in later editions of his world map, as the representation of China changed to conform more closely to that in Chinese maps.

Ricci did perform some measurements of his own to adapt Chinese information to representation using projection. He determined latitude and longitude for a number of places in China. But errors were introduced into

18. See Wang Yong, *Zhongguo dili tuji congkao* (Collected studies on Chinese geographic maps and documents, 1st ed. 1947), rev. ed. (Shanghai: Shangwu Yinshuguan, 1956), 20–21. The *Yutu beikao* was reported to be at the Library of Congress, but it has not been located there. See also p. 409 on the *Huiji yutu beikao juanshu*.

19. See Ch'en, "Matteo Ricci's Contribution," 357–59 (note 11).

his maps because he thought incorrectly that each degree consisted of 250 *li*, when the correct figure was about 194 *li*. In any case, Ricci had the means to teach European techniques of projection, and his Chinese friends and admirers certainly would have had the opportunity to learn those techniques.

But apart from the reproductions of Ricci's maps mentioned above, no Chinese geographic maps from the Ming show evidence of the use of the graticule or any analogous coordinate system. The Chinese reproductions themselves, as Ch'en has pointed out, betray an incomplete understanding of Ricci's maps.[20] Besides omitting the graticule in some cases, they mislabel certain countries, misinterpret Ricci's notes as place-names, and fail to consider geographic extent when locating countries by coordinates. In the *Fangyu shenglüe*, for example, the coordinates for France are given as 45° north latitude and 5° longitude (the Fortunate Isles being 0°).

Historians of cartography have thus seemed to be answering a nonquestion. It is doubtful whether Ricci's maps had much cartographic effect at all. Wide circulation is not necessarily a measure of influence, and exposure does not always mean adoption. It therefore seems that Ricci's influence is more properly spoken of in a European context, in which changing representations of China are directly attributable to his maps.

European Cartography and Qing Mapping

If Chinese cartography had still not joined with European cartography during the Ming, some might argue that it did so during the Qing—again under foreign influence. During the Qing dynasty, Chinese culture was exposed to foreign influence primarily from two sources: conquest by the Manchus and contact with Europeans—first through Jesuit missionary efforts (continued from the late Ming) and then through mercantile expansion by European trading nations. Some changes were wrought by these foreign contacts, especially by the mercantile expansion, but the effect on cartography was hardly profound. To demonstrate this claim, let us examine various levels of mapping during the Qing. Cartographic history during the Qing can be viewed in general terms as a double-layered phenomenon: mapping at the top of the political hierarchy somewhat influenced by foreign cartographic practice, and an indigenous layer below that was resistant to foreign influence until late in the nineteenth century.

Comprehensive Surveys of the Empire

The Manchus were outnumbered about fifty to one by the conquered population, and they ultimately controlled an empire roughly twenty times the size of their original power base. The Manchus had studied their Chinese history and were well aware that foreign dynasties had tended to be short-lived. They were determined not to repeat the mistakes made by their predecessors: a loss of tribal military prowess and factionalism between an indigenous bureaucracy and a foreign aristocracy. The system that evolved under the Qing has been described as a Manchu-Chinese dyarchy, intended to minimize the distinctions between conqueror and conquered.[21] The Manchu rulers also adopted the Chinese language, promoted Chinese culture, and commissioned projects to preserve Chinese cultural artifacts. By such projects, they sought not only to win favor among Chinese intellectuals, but also to control public opinion. By overseeing editing projects, for example, they could ensure that texts expressing antiforeign or anti-Manchu sentiments were censored.

For the expansion and maintenance of political control, reliable geographic information was essential. Whether the Manchus had their own cartographic tradition is unknown. After their conquest of China, the Manchus relied on geographic information from Chinese sources, as they had before the conquest, and also obtained information from comprehensive, empirewide surveys carried out by the Jesuits.

The Jesuit surveys and the resulting maps are probably the most familiar aspects of Qing cartography. Less well known is the comprehensive survey attempted at the beginning of the Qing by the Manchu government. Unlike the Jesuit surveys, this survey did not have as its end the production of maps; it was a tool for consolidating political authority. As a means of securing popular support, the early Manchu government proclaimed that taxes would be "collected entirely according to the original quota recorded in the accounts of the former dynasty."[22] The Ming tax and land records, however, were hopelessly outdated, the most recent being at least twenty-five years old. On 9 June 1646, Dorgon, the prince regent, decided to rectify this situation. He ordered his grand secretary to find out how much land was being cultivated throughout the empire and to audit the tax collection procedures of local governments. As a result,

20. Ch'en, "Matteo Ricci's Contribution," 347 (note 11).

21. This system has been described in Frederic Wakeman, Jr., *The Great Enterprise: The Manchu Reconstruction of Imperial Order in Seventeenth-Century China*, 2 vols. (Berkeley and Los Angeles: University of California Press, 1985); and Robert B. Oxnam, *Ruling from Horseback: Manchu Politics in the Oboi Regency, 1661–1669* (Chicago: University of Chicago Press, 1975).

22. *Da Qing Shizu Zhang (Shunzhi) huangdi shilu* (Veritable records of Shizu, emperor Zhang [Shunzhi], of the Great Qing, compiled ca. 1672) (1937; reprinted Taipei: Hualian Chubanshe, 1964), 17.16b; cited hereafter as *Shizu shilu*. The translation is that of Wakeman, *Great Enterprise*, 1:463 (note 21).

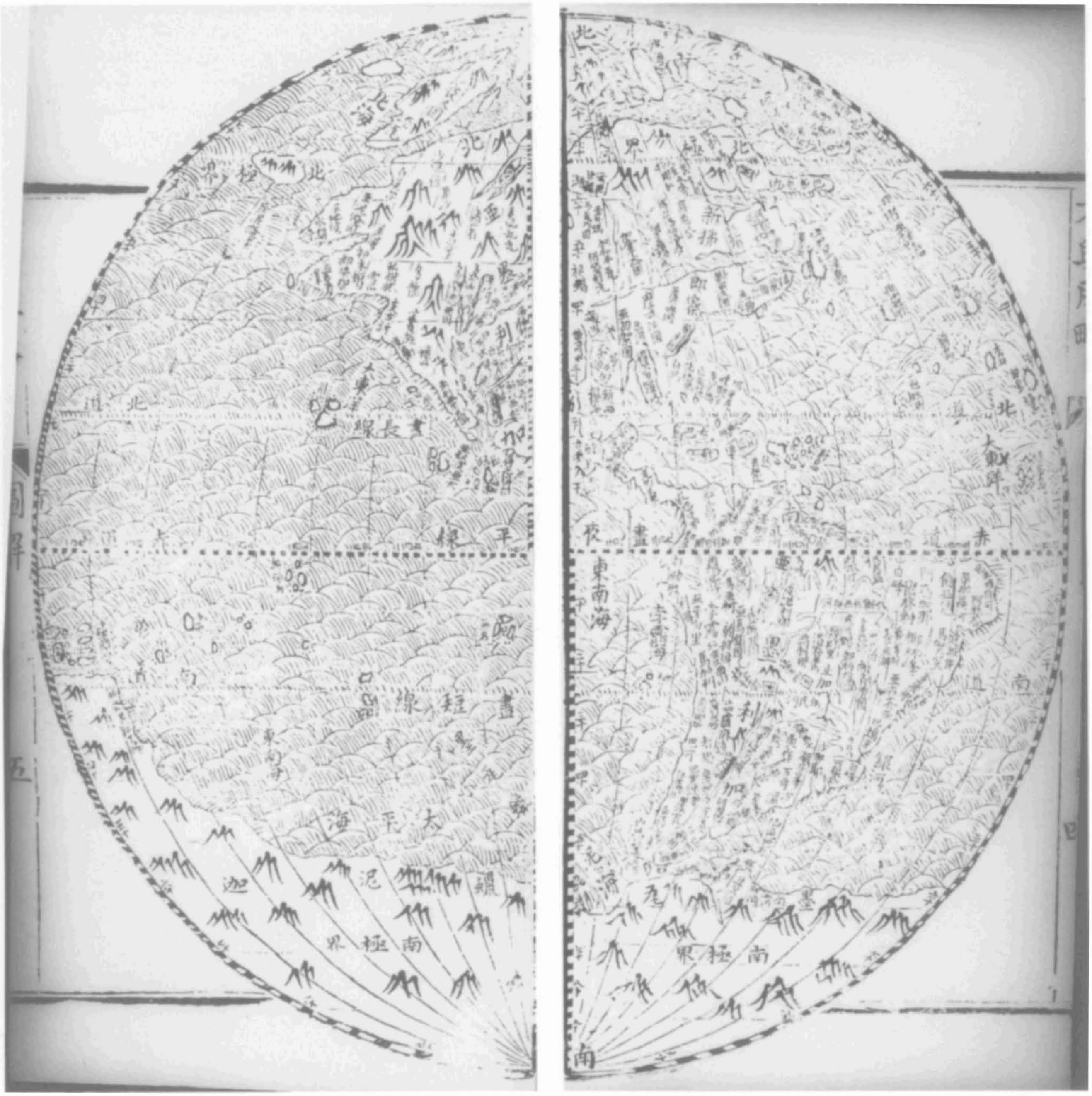
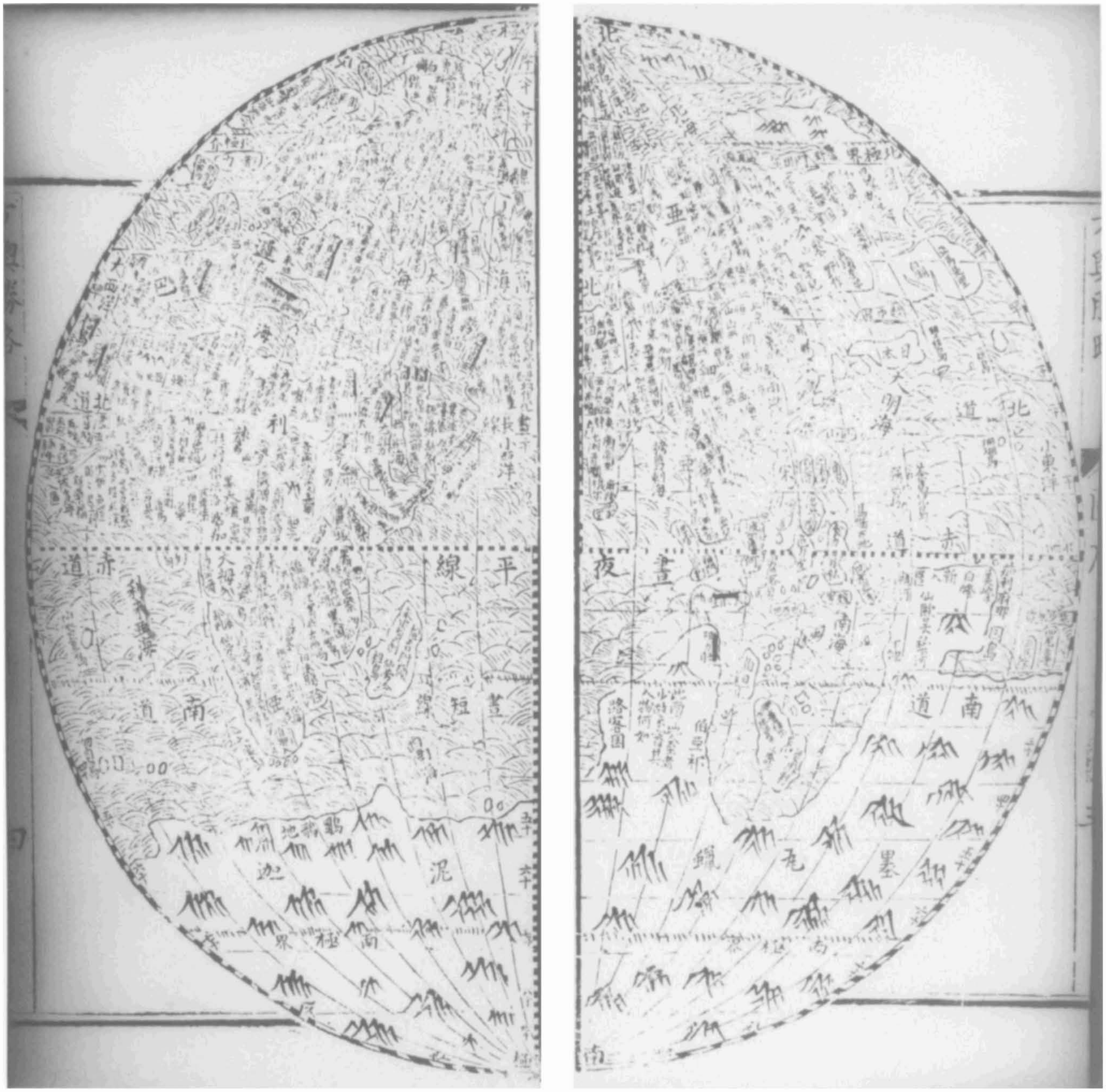


FIG. 7.6. CHINESE RENDITION OF THE TWO HEMISPHERES. After a map of the two hemispheres drawn by Matteo Ricci in 1601. Left, Western Hemisphere; right, Eastern Hemisphere. Size of the originals: unknown. From the *Fangyu shenglüe* by Cheng Boer et al. Photographs courtesy of Cao Wanru, Institute for the History of Natural Sciences, Academia Sinica, Beijing.

the first empirewide cadastral survey since the 1580s was ordered: "Investigate thoroughly and examine in detail. Decide on comprehensive registers of taxes and service. Present to us for our personal review. Promulgate them throughout the empire."[23] According to Wakeman, however, the determination of taxes and service "really amounted to a reevaluation of quotas rather than a thorough national land survey."[24]

23. *Shizu shilu*, 25.24b (note 22). The translation is based on that in Wakeman, *Great Enterprise*, 1:464 (note 21).

24. Wakeman, *Great Enterprise*, 1:464 n. 119 (note 21).



The Manchu rulers' experience with Ming records helped make them receptive to the Jesuits' offer to make better maps of China than those available at that time. When the Jesuits suggested to the Kangxi emperor in 1698 that they should undertake a survey of the empire, both sides knew that the Jesuits had already demonstrated the superior predictive power of their astronomical methods in comparison with traditional Chinese, as well as Islamic, methods. On 29 July 1644, Johann Adam Schall von Bell (1592–1666), a Jesuit missionary, petitioned the throne, offering to rebuild astronomical instruments destroyed by bandits before the Manchus took power and presenting "the prediction of a solar eclipse on the first day of the eighth month of this year [1 September 1644], calculated according to new Western methods": "In some provinces the eclipse will appear earlier, in others later. The various data are listed here for examination. I humbly beg a decree to the [board of rites] to test the measurements publicly at the proper time."[25] Schall von Bell's request was granted in an edict that said in part: "For many years the old calendar has been inaccurate whereas the new methods from the West have often been accurate. We knew this."[26] The test confirmed what the imperial court had already known: "As for the hour, minute, and second, the position, and other details regarding the start of the eclipse, the total eclipse, and the sun's recovery, only the new methods from the West coincided point for point. The Datong [the official Ming method] and the Islamic methods were both erroneous as to the time."[27] On 19 October 1644 the Western calendar was officially adopted, and on 31 October Schall von Bell was named director of the imperial board of astronomy.

During the Kangxi period (1662–1722), the Jesuits were given an opportunity to demonstrate the virtues of their cartographic techniques. They accompanied the emperor on northern expeditions, and they had taught him how to take astronomical measurements and to measure elevations and distances. The Kangxi emperor had a deep interest in mathematics, and he was also interested in learning geography: "Our territory is complicated, broad and vast, extending ten thousand *li*. . . . Climatic conditions vary, and the people's customs differ. These have not been compiled. How is one to know them completely? We observe that writers on geography have been fairly numerous since the Han dynasty. But their accounts vary in their amount of detail, and reports produced then and now differ. We therefore order that a bureau be set up to collect all kinds of documents, verify the gazetteers, and compile a book."[28] This book was to be titled *Da Qing yitong zhi* (Comprehensive gazetteer of the Great Qing realm, completed 1746), and its editors were enjoined to report on strategic passes, mountains, streams, customs, and personages as well as to draw maps.

The lack of uniform practices of representation among Chinese cartographers, as is described below, hampered the production of a comprehensive geographic record such as the emperor envisioned. In 1698 the Jesuit missionary Dominique Parrenin (1665–1759) examined various provincial maps and found errors in the location of prefectures, counties, and cities. He memorialized the emperor and recommended a survey of the empire. The emperor responded by asking Joachim Bouvet (1656–1730) to return to France and recruit more missionaries to come to China. Bouvet went back to France and returned with more than ten Jesuits trained in astronomy, mathematics, geography, and surveying. The emperor put them to the test. About 1705, for example, the emperor commissioned them to survey and map the region of Tianjin, in part to determine whether flooding in the area could be prevented and in part to judge the exactitude of European cartographic methods.[29] The Jesuits completed the map and presented it to the emperor within seventy days; he was satisfied with the results.

In 1707 the emperor commissioned the Jesuits to survey the area around the capital of Beijing and to compare their results with the information on old maps. A new map was completed in six months and presented to the emperor, who inspected it and pronounced it superior to previous efforts. In 1708 he sent Jesuits out to survey and determine the position of the Great Wall. According to the Jesuit missionary Antoine Gaubil (1689–1759), "Those who are interested in the geography of China will perhaps be very pleased to know: first that it is Fr. Parrenin who found the means to nurture in the Kangxi emperor the desire to see a map of the Great Wall; second that the prince was so pleased with the map of the wall made by Frs. Bouvet, Régis, and Jartoux that he resolved to have made the map of all of his vast states in China and Tartary."[30] Gaubil wrote this statement in 1728 and does not specify when Parrenin proposed that a map of the Great Wall be made. Foss seems to identify this proposal with the one for a comprehensive survey,[31] but Gaubil's language does not suggest a comprehensive survey. Parrenin was in China when the survey of the Great Wall was commissioned, and it seems more likely that Gaubil was referring to that survey.

The survey of the Great Wall began nearly a decade of surveying that culminated in the publication of the first Jesuit atlas of China. The emperor apparently saw the political advantages of measured maps: they would improve communication and aid in military planning. The Great Wall itself was vital to both government concerns

25. *Shizu shilu*, 5.24a (note 22).

26. *Shizu shilu*, 5.24a (note 22).

27. *Shizu shilu*, 7.1b (note 22).

28. *Da Qing Shengzu Ren (Kangxi) huangdi shilu* (Veritable records of Shengzu, emperor Ren [Kangxi], of the Great Qing, compiled ca. 1739) (1937; reprinted Taipei: Hualian Chubanshe, 1964), 126.15b–16a.

29. This survey is described in Jean Baptiste Du Halde, ed., *Lettres édifiantes et curieuses, écrites des missions étrangères par quelques missionnaires de la Compagnie de Jésus*, 27 vols. (Paris: Nicolas le Clerc, 1707–49), 10:413–15, reproducing a letter written in 1705 by Jean-François Gerbillon (1604–1707).

30. Antoine Gaubil (1689–1759), *Correspondance de Pékin, 1722–1759* (Geneva: Librairie Droz, 1970), 214. The translation is based on that in Theodore N. Foss, "A Western Interpretation of China: Jesuit Cartography," in *East Meets West: The Jesuits in China, 1582–1773*, ed. Charles E. Ronan and Bonnie B. C. Oh (Chicago: Loyola University Press, 1988), 209–51, esp. 223–24.

31. Foss, "Western Interpretation of China," 223 (note 30).

and thus an understandable choice. The task of measuring the wall fell to Bouvet, Jean-Baptiste Régis (1664–1738), and Pierre Jartoux (1669–1720). On 4 June 1708 they left Beijing and in four days reached Shanhaiguan, where the wall meets the sea. They then followed the wall westward, keeping track of direction with compasses, measuring distance with cords, and determining latitude from the height of the sun. After two months Bouvet was forced to return to Beijing because of illness, but Régis and Jartoux kept on. On 10 January 1709 they returned to Beijing with a map about five meters long, depicting gates, forts, rivers, hills, and mounds. The emperor was pleased with the map and directed that the surveying continue to cover the rest of the empire. Gaubil provides this account of the Jesuits' surveying methods:

> These Fathers requested a quadrant of two feet two inches in radius; they often took care to check it, and they constantly found that it represented elevations too great by a minute. They had large compasses, many other instruments, a pendulum and other things for the execution of the emperor's orders. With cords divided precisely, they accurately measured the way from Peking.... On this road they often took by observation the height of the meridian of the sun; they observed at every moment the rhumb and took care to observe the variation and declination of the peak.
> ... In all these vast regions, the Fathers ... have observed the height of the pole, observed the rhumbs ..."[32]

The survey included tributary states such as Korea, but the Jesuits sometimes encountered difficulties in surveying such areas. In the case of Korea, any measurements they obtained were evidently gotten through subterfuge. Matteo Ripa (1682–1745), a secular priest in Beijing, wrote that the Koreans were "extremely jealous of strangers" and denied entrance to the Europeans:

> This part of the business was consequently executed by a mandarin, purposely instructed by the Jesuits, and then sent thither by the Emperor, under pretext of an embassy: even then they watched every movement of the mandarin so closely, that he could not take a step without being observed by the guards, who never left him, and wrote down all he said or did. Thus, being unable to measure the longitude with a line, he could only calculate the miles by the hour. This ambassador, with whom I was intimately acquainted, informed me that he had only succeeded in taking the sun's altitude by making them believe that the instrument he used was a sun-dial, and that he stopped to look at it in order to ascertain the time.[33]

Ripa's account gives the impression that the Jesuit map of Korea (fig. 7.7) was based on a survey, but this seems to be true only of the northern portion. Ripa's account needs to be supplemented by Régis's statement, reported by Jean Baptiste Du Halde (1674–1743), that a map received by a "Tartar lord" (an envoy) from the Koreans served for the most part as the basis of the Jesuit map of Korea (see pp. 299–305).

The Jesuits' survey of the empire was completed in 1717, and an atlas was presented to the emperor the following year. It was titled *Huangyu quanlan tu* (Map of a complete view of imperial territory), perhaps in recognition of the emperor's desire to be able to view all parts of the empire at a glance.[34] The emperor was pleased with the results, saying that "the mountain ranges and waterways were all in accord with the 'Yu gong' [Tribute of Yu]."[35] The maps in the atlas used a trapezoidal projection; depicted the Qing empire, including Mongolia and Manchuria, east of Hami; and were drawn to a scale of 1:400,000 to 1:500,000. The meridian running through Beijing was adopted as the prime meridian, in part to avoid errors in longitude that would be introduced by adopting a European prime meridian.[36]

The Kangxi Jesuit atlas, as it came to be known, had a complicated publication history. The earliest edition was printed in China with woodblocks and consisted of twenty-eight maps. In 1719 a manuscript version with thirty-two maps was produced. This version was divided into forty-four copperplates engraved by Matteo Ripa, who produced an atlas drawn to a scale of 1:1,400,000.[37]

32. Gaubil, *Correspondance de Pékin*, 214 (note 30). The translation is based on Foss, "Western Interpretation of China," 227–28 (note 30).

33. Matteo Ripa, *Memoirs of Father Ripa, during Thirteen Years' Residence at the Court of Peking in the Service of the Emperor of China*, trans. and ed. Fortunato Prandi (London: John Murray, 1846), 65.

34. Joseph-Anne-Marie de Moyriac de Mailla, *Histoire générale de la Chine ou annales de cet empire*, 13 vols. (Paris: Grosier, 1777–85), 11:314.

35. *Qing shi gao jiaozhu* (Edited and annotated draft history of the Qing, original draft completed 1927), 15 vols. (Taipei: Guoshiguan, 1986–), chap. 290 (11.8773–74). See also *Qing shi* (History of the Qing), 8 vols. (Taipei: Guofang Yanjiuyuan, 1961), chap. 284 (5:4010).

36. Jean Baptiste Du Halde, *Description géographique, historique, chronologique, politique, et physique de l'empire de la Chine et de la Tartarie chinoise*, 4 vols. (Paris: Lemercier, 1735), 1:xxxvi. An English translation of this work was published as *A Description of the Empire of China and Chinese-Tartary, Together with the Kingdoms of Korea, and Tibet*, 2 vols. (London: Edward Cave, 1738–41).

37. Work on the plates began in 1718, perhaps with the first edition as a rough guide. Copies of the copperplate edition survive in England (King George III's Topographical Collection, British Library, London) and Italy (Istituto Universitario Orientale di Napoli). See Foss, "Western Interpretation of China," 234 and 249 n. 93 (note 30), and Helen Wallis, "Chinese Maps and Globes in the British Library and the Phillips Collection," in *Chinese Studies: Papers Presented at a Colloquium at the School of Oriental and African Studies, University of London, 24–26 August 1987*, ed. Frances Wood (London: British Library, 1988), 88–96, esp. 93.

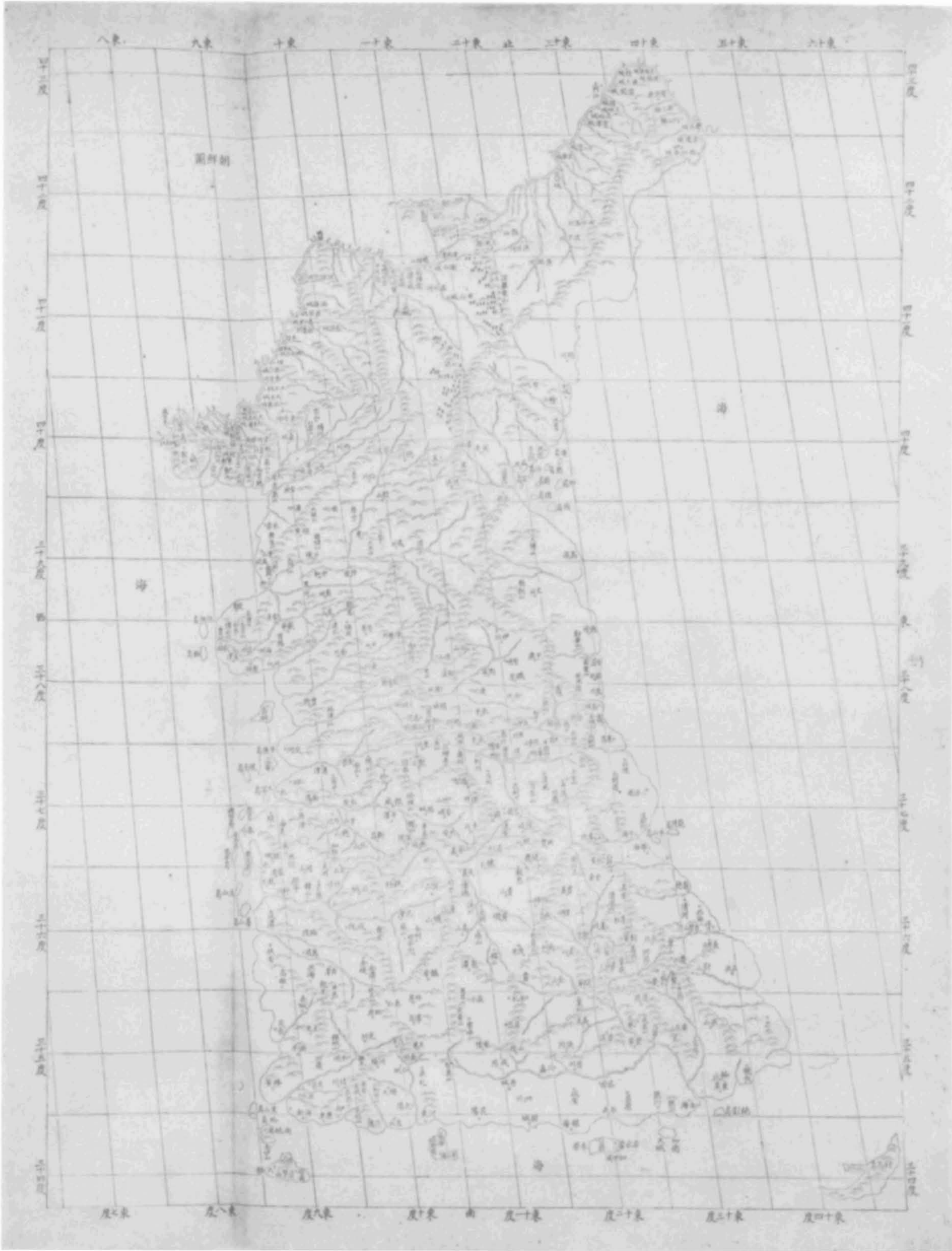


FIG. 7.7. MAP OF KOREA FROM THE *HUANGYU QUANLAN TU*. This map is from the 1721 edition of the atlas. The map is close to modern representations of northern Korea down to about the thirty-ninth parallel, but below that the image suffers in comparison. Seoul, for example, is placed too far from the west coast, and the Han River flows to the southwest instead of the northwest.
Size of the original: 58 × 43 cm. By permission of the British Library, London (Maps C.11.d.15).

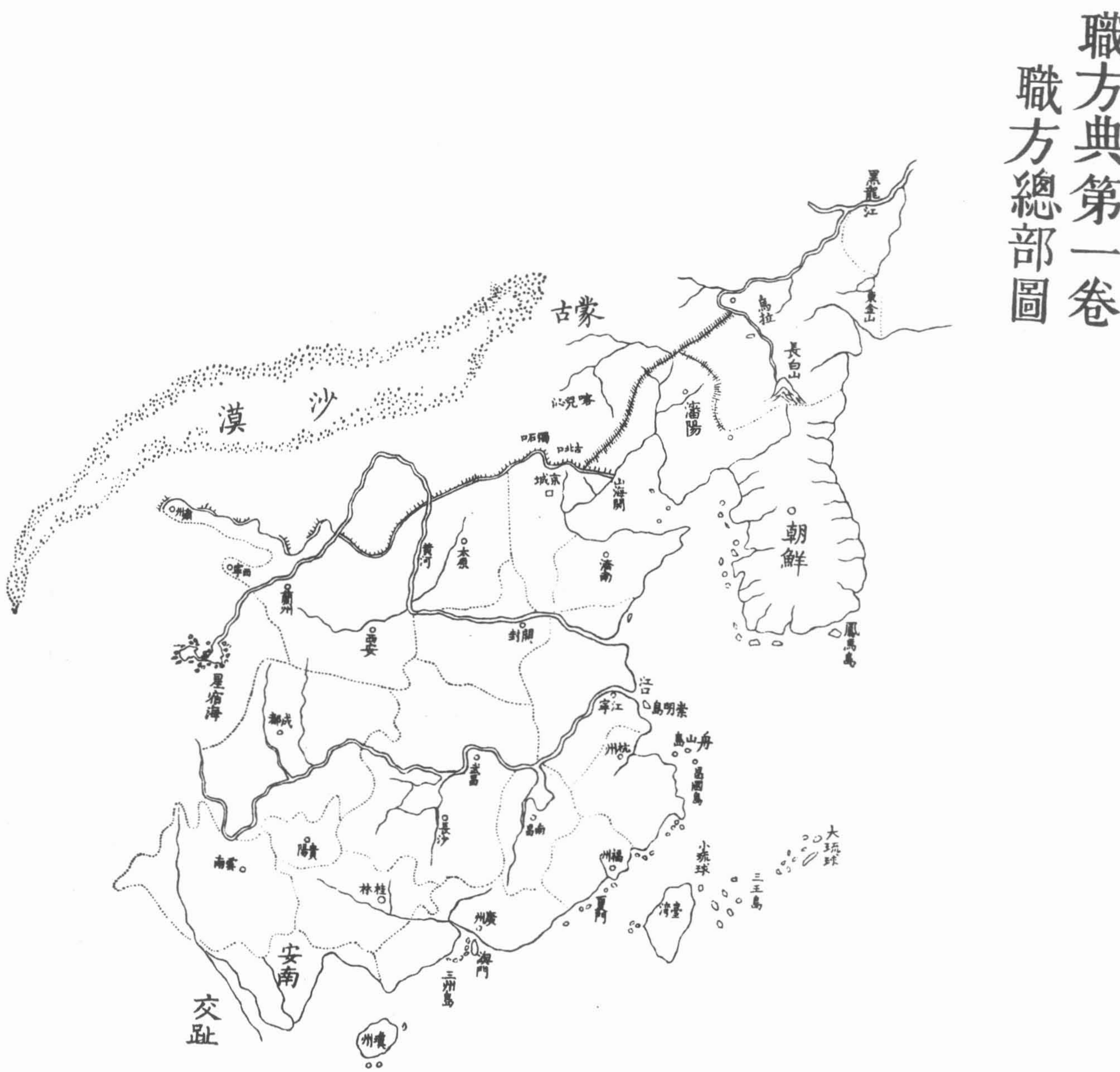


FIG. 7.8. CHINESE VERSION OF A JESUIT MAP OF THE QING EMPIRE. This map from a Chinese encyclopedia was based on the one prepared for the Kangxi emperor by Jesuit missionaries. One difference is the lack of parallels and meridians that appeared on the original. Size of the image: 20 × 19 cm. From Chen Menglei, Jiang Tingxi et al., comps., *Gujin tushu jicheng* (completed 1726, printed 1728) (reprinted Shanghai: Zhonghua Shuju, 1934), vol. 63.

This version is mentioned in the *Qing shi gao* (Draft history of the Qing, completed 1927): "In the fifty-eighth year [of the Kangxi reign period] the atlas was completed. It was a comprehensive atlas, consisting all together of thirty-two sheets. These were separate provincial maps, each province on one sheet."[38] A second woodblock edition was printed in 1721, the same in format as the manuscript version of 1719 and drawn to a scale of 1:2,000,000. This woodblock edition was sent by the Jesuits to Europe and served as a source for Du Halde's *Description géographique, historique, chronologique, politique, et physique de l'empire de la Chine* (1735) and Jean Baptiste Bourguignon d'Anville's *Nouvel atlas de la Chine* (1737).[39] In 1726, 216 maps of the empire and its

38. *Qing shi gao jiaozhu*, chap. 290 (11.8773) (note 35).

39. Du Halde, *Description de la Chine* (note 36); Jean Baptiste Bourguignon d'Anville (1697–1782), *Nouvel atlas de la Chine, de la Tartarie et du Thibet* (The Hague: H. Scheurleer, 1737). The woodblock edition

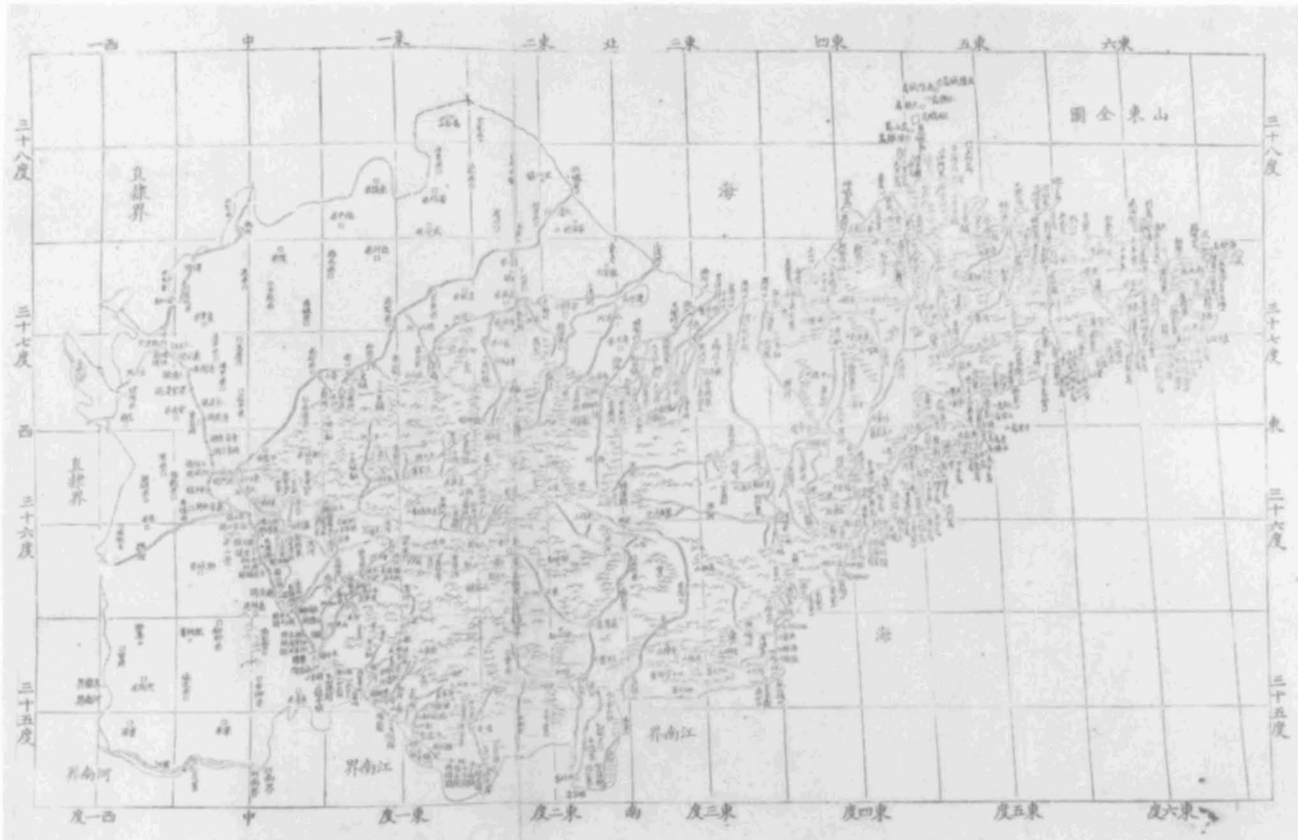


FIG. 7.9. MAP OF SHANDONG PROVINCE FROM THE *HUANGYU QUANLAN TU*. From the 1721 edition of the atlas. Size of the original: 25.5 × 40 cm. By permission of the British Library, London (Maps C.11.d.15).

administrative subdivisions, excluding Mongolia and Tibet, were included in the Chinese encyclopedia *Gujin tushu jicheng* (Complete collection of books and illustrations, past and present, printed 1728).[40] These were based on the maps in the Kangxi Jesuit atlas but omitted the lines of latitude and longitude (see fig. 7.8).

In recent years, some have tried to claim the Kangxi atlas as primarily a Chinese rather than a foreign achievement and thus put forth an argument for the advanced state of Chinese cartography. Chinese and Manchu assistants performed measurements for the Jesuits, and the Jesuits often relied on Chinese geographic works, though checking them when possible against their own observations. Beyond the use of parallels and converging meridians, the appearance of the maps is more Chinese than European. Toponyms appear in Chinese, and the map signs, such as those for rivers and mountains, all derive from the Chinese tradition (see fig. 7.9). For these reasons, Needham might appear justified in writing that "while the transmission of Renaissance cartography to China in the time of Matteo Ricci cannot be underestimated, the reverse transmission of geographical information about East Asia to the 17th-century geographers of Europe must also be remembered. It was owing to the solid work of generations of Chinese map-makers that knowledge of this part of the world became incorporated in modern geography."[41]

Needham's assertion about a reciprocal transmission of ideas requires some qualification. It is not totally clear that Ricci's introduction of Renaissance cartography into China was actually a case of transmission, since it is far from certain that Chinese mapmakers accepted European techniques. The evidence of Chinese maps from the time of Ricci's arrival and, as will be seen below, up through most of the nineteenth century hardly suggests a successful transmission of European cartography. Furthermore, the Kangxi atlas involved much more than a transmission of the work of Chinese mapmakers to Europe.

In the first place, the Kangxi emperor turned to the Jesuits as an alternative to Chinese mapmakers. For this

of 1721 is reproduced in the second volume (box of maps) of Walter Fuchs, *Der Jesuiten-Atlas der Kanghsi-Zeit*, 2 vols. (Beijing: Fu Jen [Furen] University, 1943).

40. See Fuchs, *Der Jesuiten-Atlas*, 1:48–56 (note 39).

41. Needham, *Science and Civilisation*, 3:590 (note 1).

reason members of the Chinese elite, who had already seen Jesuits displace native scholars from the astronomical bureau, regarded the project with suspicion. The emperor saw the initial stages of the survey as a kind of contest between cartographic traditions. In 1710, after the Jesuits presented a map of Beizhili, the provincial seat of the imperial government, the emperor examined the map himself and saw that areas he was familiar with and had previously ordered Manchus to measure had been "justly exhibited." He then "signify'd to the Missionaries that he wou'd answer for the Accuracy of it; and that if the rest proved as good, their Performance wou'd satisfy him, and be out of the reach of Criticism."[42] Without European techniques, the atlas could not have been made. The Jesuits' use of native materials was made easier by the emperor's standardization of the units of linear measurement. In 1704 the emperor stipulated that two hundred *li* should correspond to one degree of longitude, basing his decision on geodetic measurements performed by the Jesuit Antoine Thomas (1644–1709). This allowed the Jesuits to convert distance information provided by the Chinese to the European coordinate system. The standardization of map scale in the Jesuit atlas, furthermore, allowed the maps in the atlas to stand independent of text. This was another departure from Chinese tradition, which, as Ricci recognized, tended to view image and text as integral to the cartographic enterprise. Perhaps the divorce of European post-Renaissance science, and cartography in particular, from textual scholarship made it difficult for Chinese intellectuals to accept European maps or recognize them as useful, so that there was less demand for them than previous historians have assumed.

Undoubtedly, the Jesuits made use of Chinese scholarship in compiling the Kangxi atlas. But this was not merely an instance of transmission of Chinese knowledge. The Jesuits' reliance on native materials was necessitated by the scope of the project, covering more area than any previous survey. The survey was directed by about a dozen Jesuit missionaries divided into teams responsible for specific areas. The Jesuits wished to complete the project as quickly as possible, and to determine directly the position of every point deemed worthy of cartographic representation would have been too time consuming. According to Du Halde, the Jesuits determined the latitude and longitude of more than six hundred locations.[43] A "method of triangles" was used to calculate the distances between cities, checked where possible by observation of eclipses.[44] The Jesuits' use of Chinese materials was thus not a matter of uncritical acceptance. The Jesuit atlas may have drawn heavily from Chinese sources, especially for place-names, linear features such as rivers, and areal features such as mountains, but the cartographic theory underlying it was European. Locations were determined according to a coordinate system based on a conception of the world different from that implied by the Chinese cartographic grid. The survey techniques needed to obtain these measurements were unknown to Chinese mapmakers, despite the use of superficially analogous techniques by Chinese astronomers (see pp. 123–24). Moreover, the technology and techniques used to determine position were all of European origin: the quadrant and tables of declination for latitudinal measurement; and for longitudinal measurement, timepieces and telescopes for the observation of the moons of Jupiter or the earth's moon. For these reasons, the Jesuit mapping of China is perhaps better treated as an example of European mapping adjusting to new cultural circumstances and drawing on information already available in China.[45]

SUPPLEMENTAL SURVEYS FOR THE IMPERIAL ATLAS

The Jesuit surveys, though extensive, did not cover the entire empire. To supplement them, the central government commissioned regional surveys, so as not omit any of its territory from the imperial atlas. In the case of Tibet, for example, a descriptive survey of the topography of Tibet was completed in 1711 and a map drawn, but because the map lacked lines of latitude and longitude, it was difficult to incorporate it into the Jesuit atlas. Thus the map was not used. The Kangxi emperor then commissioned a measured survey that was carried out by a mathematician from the imperial board of astronomy. The results of this survey were compiled in a map submitted to Jesuit scholars in 1717 for review. They found a number of mistakes: for example, the city of Lhasa was shown as lying at about 30.5° north latitude, when its actual position is about 29.4°. Thus a team of surveyors was dispatched to recheck certain of the latitudinal and longitudinal measurements. A complete resurvey was not ordered because of a wish not to offend the official trained at the imperial board of astronomy and, perhaps more important, because military conflict with competitors for Tibet made such a survey potentially dangerous. For reasons that are unclear, the position of Lhasa is still

42. Du Halde, *Description of the Empire*, 1:viii (note 36).

43. Du Halde, *Description of the Empire*, 1:viii (note 36). De Mailla lists about 630 points for which latitude and longitude were determined; see *Histoire générale*, 12:179–96 (note 34). According to Matteo Ripa, latitude was determined with "mathematical instruments" and longitude with "long chains" (*Memoirs*, 65 [note 33]).

44. Du Halde, *Description of the Empire*, 1:x (note 36). The "method of triangles" was perhaps triangulation as developed by Gemma Frisius (1508–55) in 1533.

45. Other useful treatments of Jesuit surveys are Foss, "Western Interpretation of China" (note 30); Fuchs, *Der Jesuiten-Atlas* (note 39); and Walter Fuchs, "Materialien zur Kartographie der Mandju-Zeit," *Monumenta Serica* 1 (1936): 386–427.

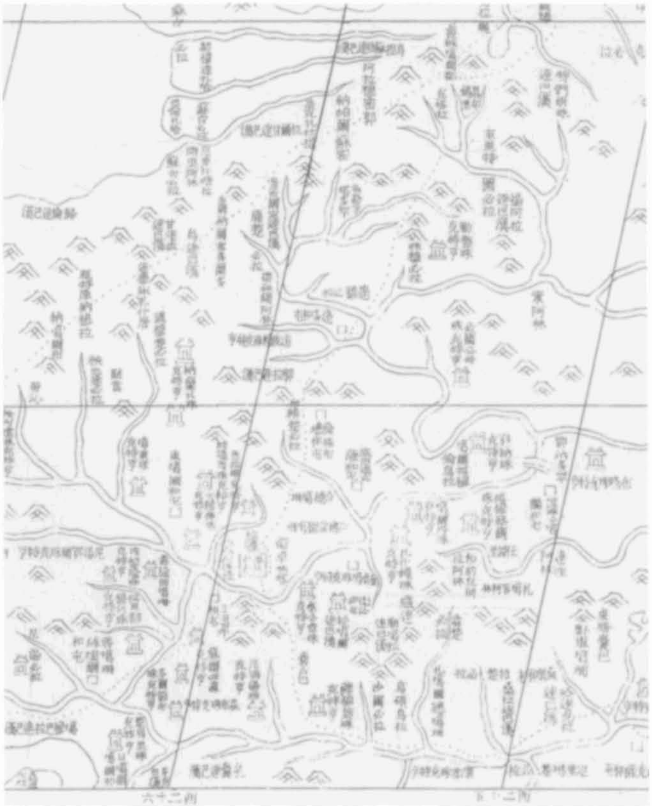


FIG. 7.10. DETAIL SHOWING LHASA FROM THE QIANLONG REVISION OF THE JESUIT ATLAS, 1760. The first Qianlong revision of the Kangxi Jesuit atlas updated information in its predecessor. One of the areas of interest to the imperial government was present-day Tibet. Although the government sent new survey teams to the area, Lhasa (represented by a square just east of the 26°W meridian) still appears above the thirtieth parallel, as in the earlier version.
Size of the image: 27.7 × 47 cm. From *Qingdai yitong ditu* (Comprehensive map of the Qing period, printed 1760) (Taipei: Guofang Yanjiuyuan and Zhonghua Dadian Bianyinhui, 1966), 149–50. This is a photo-reprint of the first edition of the Qianlong Jesuit atlas, which was printed using copperplates.

incorrect on the maps included in the 1721 edition of the Jesuit atlas. Not until the 1750s was a comprehensive survey undertaken. The results were apparently submitted too late to be incorporated into the first Qianlong revision of the Kangxi atlas, printed with copperplates in 1760: Lhasa still appears at the wrong latitude (fig. 7.10).[46]

As in the case of Tibet, the surveying and mapping of what is now Xinjiang was hampered by conflict with the Dzungars. The conflict began late in the seventeenth century when the Dzungars, in an attempt to establish a Central Asian empire, threatened eastern Mongols who were under Qing protection. Not until 1755 did the Qing government believe the Xinjiang area secure enough to dispatch a survey team. The team included the Jesuits Felix da Rocha (1713–81) and Joseph d'Espinha (1722–88), who were commissioned to perform the measurements. The survey took four years to complete, and in 1769 Michel Benoist (1715–74) was commissioned to produce an atlas based on the supplemental surveys and the earlier Jesuit atlas. The Qianlong emperor was already familiar with Benoist's cartography: in 1764 the emperor had ordered him to copy a European world map for display in the throne room of the imperial palace.[47] Benoist's atlas, consisting of maps on 104 sheets, was completed within a year and printed with woodblocks. This work was titled the *Qianlong neifu yutu* (Terrestrial atlas of the inner prefectures of the Qianlong period [1736–95]). A copperplate version was published in 1775. The maps are drawn to a scale of 1:500,000, and toponyms appear in Chinese. Each map is divided into five-degree increments of latitude, so that the atlas has a total of thirteen bands, each five degrees wide—hence its alternative name, *Qianlong shisan pai tu* (Map in thirteen bands of the Qianlong period). As with the Kangxi Jesuit atlas, Needham claims the Benoist atlas as an achievement of Chinese cartography: "Once again China was ahead of all other countries in the world in map-making."[48] But as before, it is hard to see how the claim can be justified, since the technology underlying the atlas was European and applied by Europeans.[49]

Gauging the Extent of Western Influence

Chinese practitioners of cartography at the provincial and local levels seem on the whole to have been untouched by the cartographic innovations introduced at court. Contact with the Jesuits was limited mainly to the imperial court, and after the dissolution of the Society of Jesus in China in 1773, opportunities for Chinese intellectuals to interact with foreign scholars became even more limited for a time. The openness of the Manchu court to

46. See Foss, "Western Interpretation of China," 235–36 (note 30); Fuchs, *Der Jesuiten-Atlas*, 73 (note 39); and Lu, *Zhongguo dituxue shi*, 186–87 (note 1).

47. De Mailla, *Histoire générale*, 11:580 (note 34). The emperor knew of Benoist's cartography from a world map prepared in 1760. It was particularly remarkable because the text on it included the first adequate discussion of Copernicus's doctrine available in China. It is described by Nathan Sivin, "Copernicus in China," in *Colloquia Copernicana 2: Etudes sur l'audience de la théorie héliocentrique*, Studia Copernicana 6 (Warsaw: Zakład Narodowy im. Ossolińskich, 1973), 63–122, esp. 92–103.

48. Needham, *Science and Civilisation*, 3:586 (note 1).

49. In the case of Matteo Ripa, engraver of the plates for the first copperplate edition of the Kangxi atlas, the technology may not have been applied particularly well. Ripa himself wrote that he had had only a single lesson in the technique of engraving with aquafortis (nitric acid), and that his attempts to use the process were not entirely satisfactory: "Thus owing to the inefficiency of the aquafortis, the lines were very shallow, which, added to the badness of the ink, caused the prints to be of the worst possible description." See Ripa, *Memoirs*, 71 (note 33).

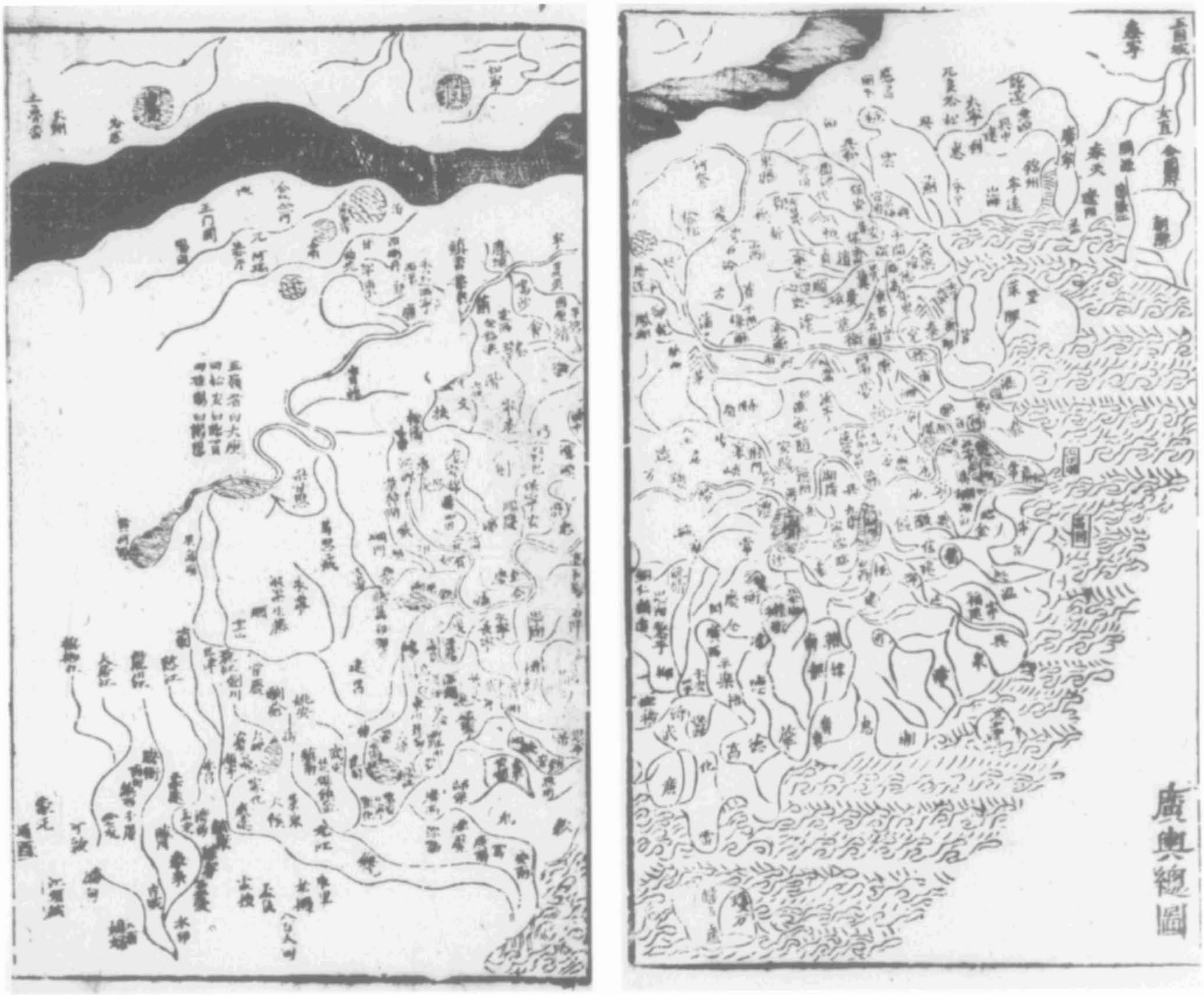


FIG. 7.11. QING MAP OF THE EMPIRE, PROBABLY BASED ON LUO HONGXIAN. The "Guangyu zongtu" (General map of the expanded territory) was compiled by Cai Fangbing in the second half of the seventeenth century. Size of each page: 22.9 × 13.7 cm. By permission of the Herzog August Bibliothek, Wolfenbüttel (Cod. Guelf. 148 Blankenb. Vb.).

foreign ideas began to wane in the latter part of Qianlong emperor's reign as the emphasis in scholarship turned increasingly inward—to the preservation of Chinese culture.

Although the Jesuit atlases produced during the Kangxi and Qianlong periods underwent various printings, it is not clear how many Chinese had access to them. According to the *Qing shi gao*, the Kangxi atlas was stored in the office of the palace treasury, where it would have been under direct palace control.[50] The cartographic record suggests that the influence of Western cartography was generally not felt among Chinese mapmakers. As a result, traditional Chinese cartographic practices continued unabated.

One atlas of the entire empire produced during the Kangxi period can serve as a gauge of the strength of the Chinese cartographic tradition after Ricci introduced Ptolemaic methods. This is the *Zengding Guangyu ji quantu* (Enlarged and revised complete atlas of the record of the expanded territory), compiled by Cai Fangbing. This work contains a general map of the Qing empire and fifteen provincial maps, all printed from woodblocks. The title bears some similarity to that of the *Guang yutu* (Enlarged terrestrial atlas, ca. 1555) of Luo Hongxian (1504–64), and it is possible that Cai used Luo's maps, or maps deriving from Luo's, as a source. This is suggested by the similarities between the general maps in the two atlases. Cai's is titled "Guangyu zongtu" (General

50. *Qing shi gao jiaozhu*, chap. 290 (11:8774) (note 35).

京師至盛京路程
崇文門即海岱門四十里至通州潞河驛七十里三河縣三河驛
七十里薊州城北二十里盤山乃呂純陽飛劍斬黃龍處仙劍猶揮山頂上
八十里玉田縣八十里豐潤縣屬遵化州八十里沙河驛
四十里永平府西有孤竹國殷孤竹君封地六十里撫甯縣
七十里升河驛四十里山海關四十里西林驛
五十里杏前所五十里東關驛四十里曹莊驛
五十里甯遠南八十里連山驛五十里杏山驛
路程
三

FIG. 7.12. PAGE FROM A ROUTE BOOK. The route from Beijing to Shenyang (Mukden, in present-day Liaoning) as it appears in a guide to Beijing.
Size of the original: unknown. From Yang Jingting, *Chaoshi congzai* (Collected notes for going to market, 1883), 1886 edition. Reproduced courtesy of the Harvard-Yenching Library, Harvard University, Cambridge. This work was originally titled *Dumen jilüe* (Abridged notes on the capital, 1864).

map of the expanded territory) (fig. 7.11), and Luo's is titled "Yudi zongtu" (General map of the empire). Despite the differences in name, the geographic coverage of the two maps corresponds closely. To the west they both reach Turfan, and to the east they reach Korea. Northward they both reach into what is now Mongolia, past the Gobi Desert. Along their southern edges, some differences are easy to detect, one of the most obvious being that Cai's map shows southwestern China as being landlocked and not bounded by ocean as in Luo's map. Cai's map is somewhat more generalized than Luo's: it omits some of the signs used for cities and leaves out the Great Wall. Another difference between the two maps is the absence of the cartographic grid on Cai's map—an omission that brings up the next point to be made: that Chinese cartographers did not believe the square grid was essential to their craft. This implies further that measurement itself, one of the main functions of the grid, was not regarded as essential to a map.

The persistence of this attitude toward measurement calls into question the belief that the arrival of the Jesuits initiated a new period in Chinese cartography. Under this interpretation, expressed by Mills and others, unmeasured mapping is an aberration in Chinese cartography from the late sixteenth century onward: according to Mills, from 1584 to 1842 "Jesuit influence was predominant," and after 1842 "scientific principles gradually triumphed" as the "opening of China effected a major revolution in Chinese cartography." Because of the predominance of Jesuit influence, Mills says, traditional maps can be seen as "fanciful misrepresentations."[51] This interpretation, however, does not seem tenable. European cartographic techniques did not begin to supersede traditional Chinese practice until late in the nineteenth century.

Much of the evidence for this last statement comes from Chinese gazetteers (*fangzhi*), compendiums of information on particular administrative units. During the Qing, more than five thousand gazetteers are known to have been produced. These generally consisted of a section of maps or illustrations (*tu*) followed by sections devoted to topics such as local history, geography, administration, water conservancy, and literature. The central government used gazetteers submitted by local and provincial administrations to compile comprehensive gazetteers of the empire.

Most of the maps in gazetteers were printed with woodblocks. In general they are inconsistent in their use of the square grid and often lack any scalar indications whatever, despite the central government's interest in careful surveys. Grids are rare on maps in gazetteers below the provincial level of administration. They tend to appear on maps published late in the Qing, in the nineteenth century—more than a century after the Kangxi Jesuit atlas. Gazetteer maps during the Qing, as in previous periods, often use pictorial representation, making them ill suited for presenting quantitative information. Generally, small-scale maps tended toward the use of abstract signs, and pictorial elements tended to dominate large-scale maps. The varied representational modes might pose a problem for a map reader attempting to use such maps to derive distances, but they were not intended for that purpose: quantitative information was often given in verbal descriptions of the areas depicted on the maps. This is especially true of route books produced during the period: maps in these books provide a sense of spatial relationship and relative position, while accompanying text provides distances along specified routes (fig. 7.12).[52]

51. See, for example, J. V. Mills, "Chinese Coastal Maps," *Imago Mundi* 11 (1954): 151–68, esp. 152.

52. On these route books, see Timothy Brook, *Geographical Sources*

These generalizations regarding the use of grids, scale indications, and mode of representation also hold true for maps produced under the auspices of the central government, where Jesuit influence was strongest. The *Da Qing yitong zhi*, for example, underwent at least two revisions after it was first completed in 1746. Although it was completed well after the Kangxi Jesuit atlas, its cartography reflects little European influence, confirming the belief that access to the atlas was limited. In the revised version published in 1842, for example, the maps are generally planimetric in mode of representation but do not have grids or expressed scales. As a result it is often difficult to relate the provincial and prefectural maps to the general map of the empire (see figs. 7.13 and 7.14).

The mapping practices of compilers of provincial and local gazetteers were more varied. The maps in the *Shaanxi tongzhi* (Comprehensive gazetteer of Shaanxi Province, 1735), for example, show a mixture of representational modes (figs. 7.15 and 7.16). None of the maps bears a cartographic grid or an expressed scale. Maps of large areas are generally planimetric with some pictorial elements, particularly in the representation of cities and mountains. Maps of smaller areas, such as mountain regions and river basins, are generally pictorial. Some maps, however, balance planimetric representation and pictorial elements. The use of pictorial signs rather than the abstract signs used in the *Guang yutu* is further evidence that cartographic representation was still not clearly distinguished from pictorial.

The mixture of representational modes is perhaps even more striking in maps in gazetteers of prefectures and smaller administrative units. In these compilations, compounds of buildings and even individual buildings are the subjects of maps, and pictorial representation is more heavily employed than in national and provincial gazetteers. I will not belabor this point here, when the maps can speak for themselves (see figs. 7.17 to 7.19 for examples of maps from Qing local gazetteers showing a mixture of planimetric and pictorial representation).

The differences in the use of pictorialism between maps in provincial gazetteers and those in prefectural or county gazetteers makes it tempting to draw some conclusions about different conventions for various administrative subunits. It may be that the decrease in pictorial elements as one moves up through the administrative levels is a response to practical demands. The larger the area to be mapped onto a single leaf, the more difficult it is to represent the area pictorially.

Regional maps, atlases, and other types of maps were not only printed with woodblocks, but also drawn using brush and ink on sheets of paper and on scrolls, which often afforded more cartographic space than the printed page. The exact size of the corpus of manuscript maps from the Qing is unknown, but such maps are known to number in the thousands.[53] Provincial and other medium-scale maps drawn on those media make greater use of pictorial representation than their counterparts in gazetteers. As an example, one can take the map of the Great Wall found in 1952 by Leo Bagrow in the Lateran Museum (fig. 7.20).[54] It was drawn on a scroll, probably between 1680 and 1700, and represents the stretch of the Great Wall extending from Jiayuguan in Gansu Province to Shanhaiguan on the coast at the border of Manchuria, a distance of about 1,700 kilometers. The map presents a mixture of representational modes: the wall itself is rendered pictorially in elevation, as are mountains and villages of non-Chinese tribes; the Yellow River and garrisons within the wall are depicted from overhead. Meijer finds that the scale of the map varies from section to section: "It seems that the map does not at all aim at a faithful representation of the length of the wall."[55] This, as Meijer points out, does not pose a problem for a map reader wishing to obtain distances. Distances between places are given in notes on the map, as well as the strength of the garrisons within the wall and the locations of barbarian tribes within and beyond the wall. The same combination of text and image appears on another map of the Great Wall, made in the first half of the eighteenth century (plate 11).

On other manuscript maps from the Qing, pictorialism is even more evident: the result is often almost indistinguishable from a landscape painting (see esp. p. 153 and figs. 6.20–6.22). This is true even for map types in which careful measurements and scale drawing might seem useful: defense maps and water conservancy maps. The *Huanghe tu* (Map of the Yellow River), dating perhaps from the mid-nineteenth century, can be taken as representative (fig. 7.21 and plate 12). This map was drawn on a scroll and depicts the lower course of the Yellow River in Jiangsu Province before 1853. Some distances are indicated in annotations, but there is no expressed scale. A square grid drawn with a pencil appears to have been added after the map image was drawn with ink and color.[56] The Yellow River and its tributaries are repre-

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of Ming-Qing History (Ann Arbor: Center for Chinese Studies, University of Michigan, 1988), 3–25.

53. Just to give an idea of the vastness of the corpus, the card catalog of imperial household maps in the Ming-Qing archives in Beijing alone is reported to fill almost ten foot-long drawers. See Frederic Wakeman, Jr., ed., *Ming and Qing Historical Studies in the People's Republic of China* (Berkeley: Institute of East Asian Studies, University of California, Berkeley, Center for Chinese Studies, 1980), 50.

54. Information concerning this map is drawn from M. J. Meijer, "A Map of the Great Wall of China," *Imago Mundi* 13 (1956): 110–15.

55. Meijer, "Map of the Great Wall," 110 (note 54).

56. This map may be among the first graphic productions in China to exhibit the use of pencil. The modern method of making pencils

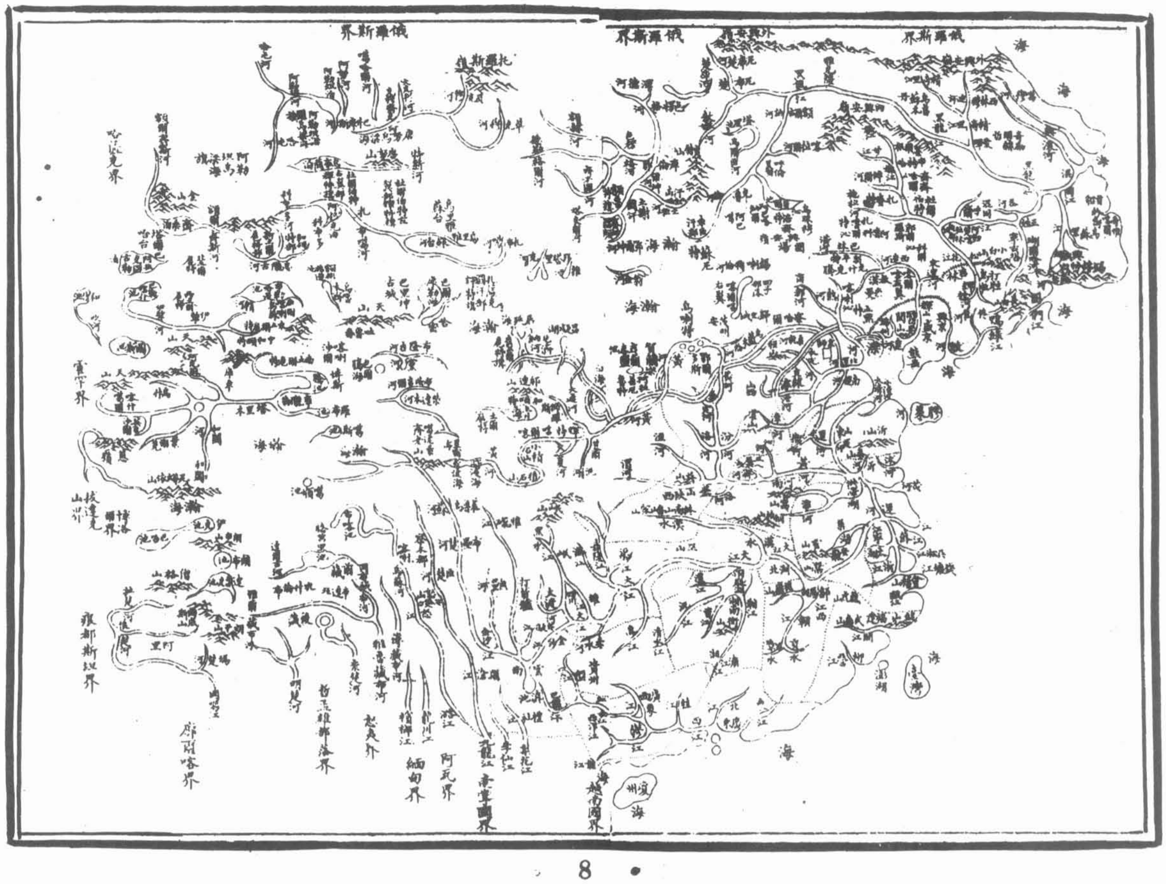

FIG. 7.13. MAP OF THE EMPIRE FROM A QING COMPREHENSIVE GAZETTEER.
Size of the image: 10.5 × 14.5 cm. From *Da Qing yitong zhi* (Comprehensive gazetteer of the Great Qing realm, last revision completed 1820; printed 1842); edition in 11 vols. (Taipei: Taiwan Shangwu Yinshuguan, 1967), 1:8. Also known as *Jiaqing chongxiu yitong zhi* (Revised comprehensive atlas of the Jiaqing reign period [1796–1820]).

sented planimetrically, while cities and mountains are drawn pictorially. The cities are drawn from a bird's-eye view, and mountains are drawn in elevation. The variable perspective these features produce is, as I stated before, characteristic of Chinese painting and early Chinese maps.

The heavy use of pictorial representation should not be taken as an indication that Chinese mapmakers were incapable of producing measured maps. Provincial surveys carried out by Chinese mapmakers did result in maps and atlases. In 1684 an imperial decree commissioned an atlas of Guangdong Province, after various officials had reported that existing accounts of the province were inadequate. In the latter half of that year, each administrative division of the province was inspected in order to gather information on the names and locations of mountains and streams, natural and artificial boundaries, historic and scenic locations, and the distances between them. The atlas was completed in 1685 and consisted of ninety-seven maps. The maps do not have grids, but distance information is given in the accompanying text. Errors in earlier accounts are also noted.[57] Evidently not enough errors were corrected, for in about 1739 the Qianlong emperor ordered a survey of Guangdong Province that resulted in a map printed from a woodblock (plate 13). The map shows administrative divisions and the distances between various places in the province. Cities, mountains, and historical remains as well as trees are represented pictorially. The author of the map states that he compiled it from eighty-eight maps that he made of different parts of the province.

The indigenous maps described here constitute an almost hidden history of late imperial Chinese carto-

with graphite and wood was not invented until 1795. When pencils were introduced into China is not known, but the opening of the treaty ports in 1842 increased the opportunities for importing them.

57. See Arthur Hummel, "Atlases of Kwangtung Province," in *Annual Report of the Librarian of Congress for the Fiscal Year Ended June 30, 1938* (Washington, D.C.: United States Government Printing Office, 1939), 229–31, esp. 230. Unfortunately, the staff at the Library of Congress has been unable to locate this acquisition reported by Hummel.

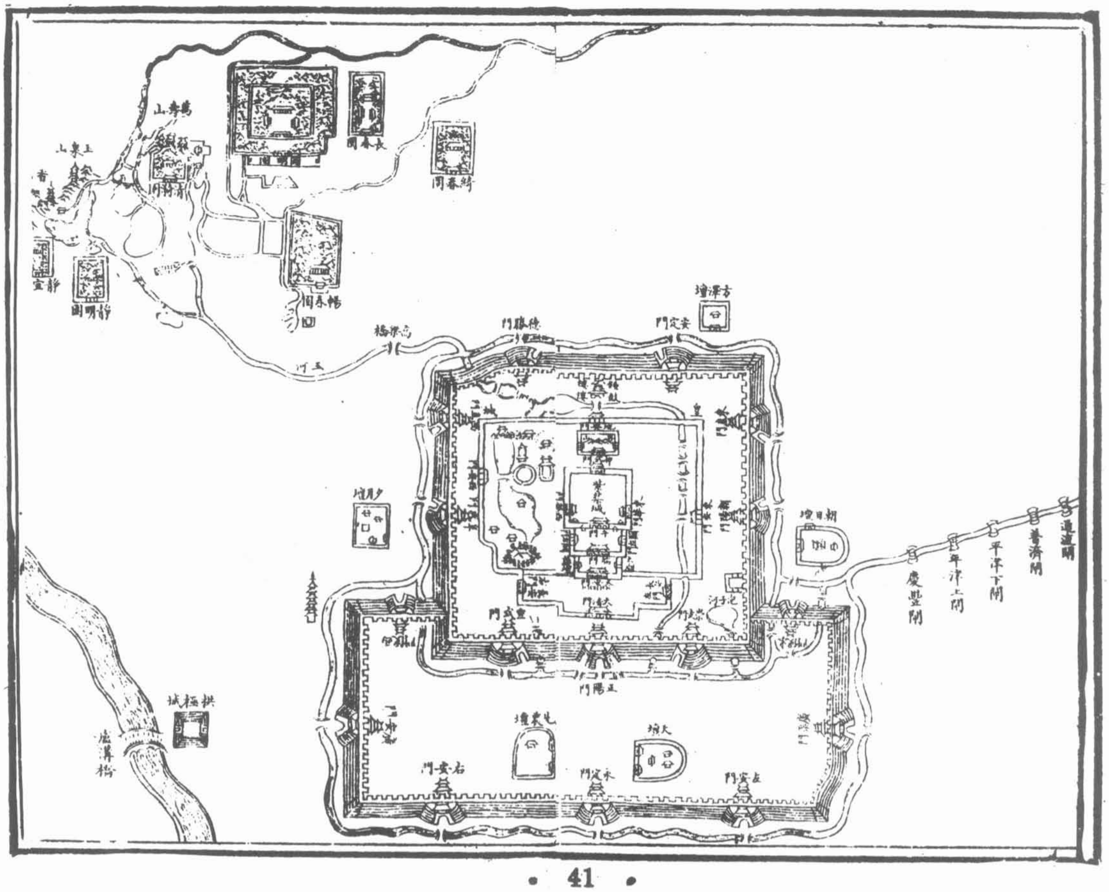

FIG. 7.14. MAP OF THE IMPERIAL CAPITAL FROM A QING COMPREHENSIVE GAZETTEER.
Size of the image: 10.8 × 13.8 cm. From *Da Qing yitong zhi* (1842); edition in 11 vols. (Taipei: Taiwan Shangwu Yinshuguan, 1967), 1:41.

graphy.[58] The sampling presented here (and in the previous chapter) suggests that European science exerted minimal influence on Chinese cartographic practice even late in the Qing. In addition, it is hard to speak of Chinese cartography as becoming more scientific in the Western sense when maps still had religious and magical functions. Notes on a map of Wutai Shan (Wutai Mountain, in present-day Shanxi Province), printed in 1846, advise one to study the map and Buddhist doctrine so that one's "troubles will disappear" and one "will be reincarnated in a blessed place" (plate 14). Maps also served astrological purposes, as they had in the past. An example of this appears in the *Henan tongzhi* (Comprehensive gazetteer of Henan, 1882). Besides geographic maps, it contains maps depicting star groups associated with various localities (fig. 7.22). This was in accordance with the *fenye*, or field-allocation system, by which events in specific sectors of the heavens were correlated with events in specific terrestrial regions (see pp. 208–10). Such star maps suggest the persistence of traditional astronomy in provincial administrations even after the adoption of European astronomy and calendrical science at the imperial court.

Late Qing Manifestations of European Influence

The exceptions to lack of foreign influence on traditional Chinese cartography generally occur after 1842, the year of China's defeat by the British in the first Opium War. The defeat helped initiate a new order in Chinese foreign relations. Many in the Qing establishment still believed in China's cultural superiority and viewed trade concessions to Western countries as a means of appeasing for-

58. One exception to the tendency to overlook such maps is Sendou Chang, "Manuscript Maps in Late Imperial China," *Canadian Cartographer* 11 (1974): 1–14. Chang also provides evidence that measured mapping was not the norm among mapmakers in late imperial China, and that political and aesthetic concerns were just as important as measurement in shaping a cartographic image.

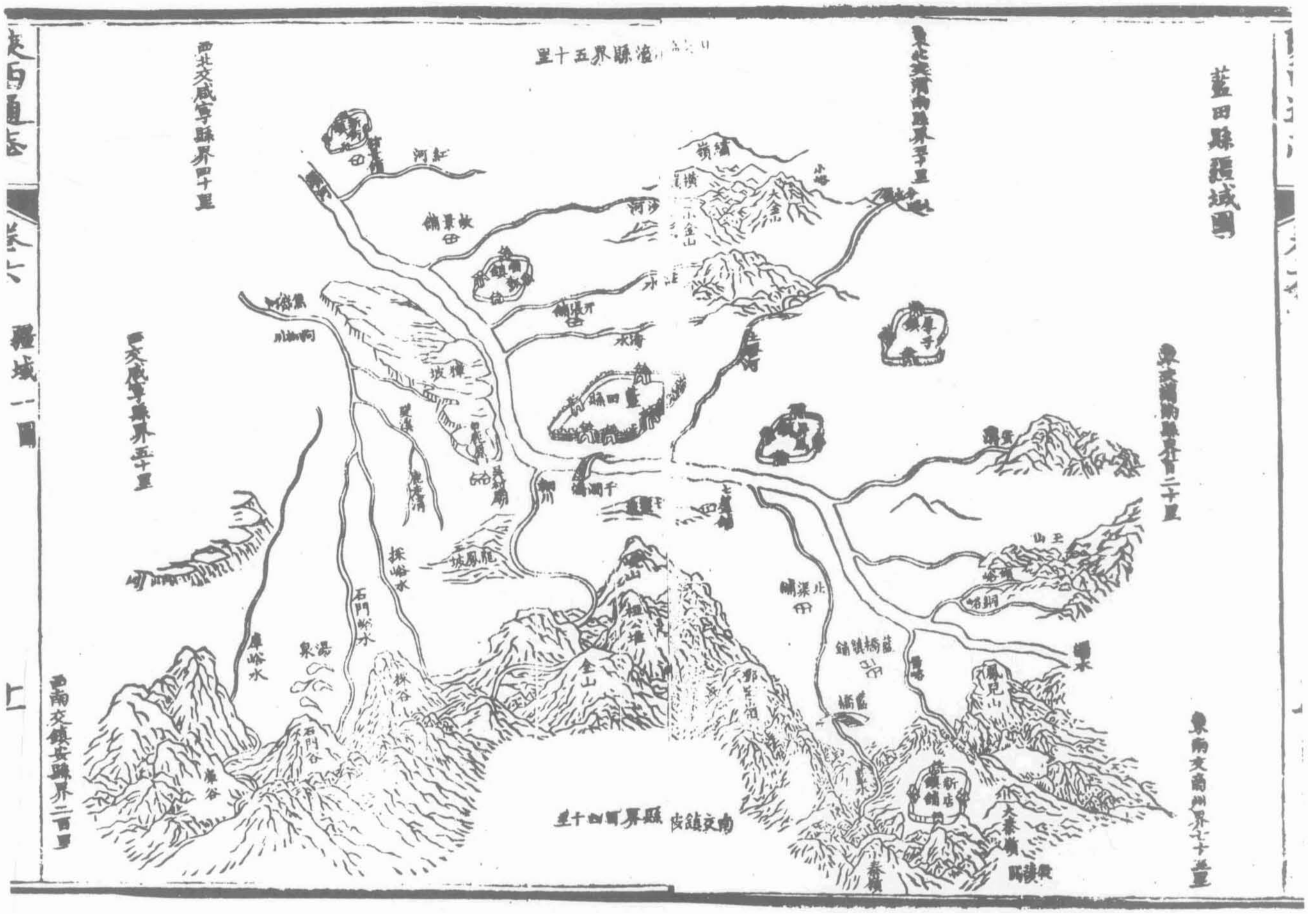

FIG. 7.15. MAP OF LANTIAN XIAN FROM A QING GAZETTEER OF SHAANXI PROVINCE. Size of the image: 9.8 × 13.8 cm. From *Shaanxi tongzhi* (1735; reprinted Taipei: Huawen Shuju, 1969), 6.10b–11a.

eigners. But some Chinese scholars came to realize that China was not the preeminent country on earth—it could no longer treat all other countries as tributary states. To deal with foreigners, China would need more reliable information about the rest of the world. One of the most notable works that were written to meet this need was the *Haiguo tuzhi* (Illustrated record of maritime kingdoms, 1844, 3d ed. 1852) by the scholar-official Wei Yuan (1794–1856). The treatise is important in the political history of the Qing, since it was the first Chinese work to "make a realistic geopolitical assessment of the worldwide dimensions of Western expansion and of its implications for Asian trade and politics."[59] Before Wei Yuan, Qing foreign policy had been directed toward Central Asia, not the maritime regions. Wei presented his challenge to this foreign policy in a traditional format. Like most gazetteers of the Ming and Qing, Wei Yuan's treatise consists of a combination of map and text. For the information presented in his verbal accounts, Wei draws on traditional Chinese as well as European sources. He acknowledges the *Sizhou zhi* (Record of four continents) as an important source. The compilation of the *Sizhou zhi* was directed by Lin Zexu (1785–1850) while he was imperial commissioner in Guangzhou (Canton) in 1839. The work consists of translations of Western-language materials about the West and Sino-Western affairs, and it was intended to shed light on the nature of European objectives in Asia. This was an aim shared by Wei Yuan, who wrote in his first preface to the *Haiguo tuzhi*:

> When defending against an enemy, whether or not one knows the disposition [or configuration, *xing*] of one's enemy makes the difference between success and failure. Similarly, in dealing with one's enemy, whether or not one knows their customs also makes the difference between success and failure. In the past those who controlled the foreigners always inspected the disposition [*xing*] of their enemy and became as familiar with that as with their own desks and chairs.[60]

59. Jane Kate Leonard, *Wei Yuan and China's Rediscovery of the Maritime World* (Cambridge: Council on East Asian Studies, Harvard University, 1984), 2.

60. Wei Yuan, "*Haiguo tuzhi* yuan xu" (Original preface to the *Haiguo tuzhi*), in *Zengguang Haiguo tuzhi* (Expanded *Haiguo tuzhi*), 2a; see the edition in 5 vols. (1852; reprinted Taipei: Guiting Chubanshe,

FIG. 7.16. MAP OF ZHONGNAN SHAN (ZHONGNAN MOUNTAINS). Size of the image: 10 × 14.2 cm. From *Shaanxi tongzhi* (1735; reprinted Taipei: Huawen Shuju, 1969), 8.4b–5a.

Wei saw maps as essential for making foreign countries more accessible to Chinese readers. From a cartographic viewpoint, Wei's work is a blend of Chinese and European practice. The historical maps of China at the beginning of his work are heavily annotated and lack grids as well as graticules. In drafting style, they are practically indistinguishable from those of traditional gazetteers (fig. 7.23): they do not have expressed scales and seem to be based on sketches. The maps of the countries of the world, however, draw on European mapping techniques (fig. 7.24). Unlike the Qing compilers of the *Ming shi* (History of the Ming, 1739; Zhang Tingyu et al.), who a century before had regarded Western geographic accounts with suspicion, Wei Yuan accepts them. Lu Liangzhi has argued that Wei Yuan shows an understanding of the strengths and weaknesses of various projections. For African countries near the equator, Lu says that Wei chose to use the Sanson-Flamsteed projection, which reduces angular distortion at latitudes near the equator. For countries above 45° latitude, he used the Bonne projection, which reduces angular distortion at the upper latitudes. In maps with navigational significance, such as those of Australia and surrounding waters, Wei chose the Mercator projection, on which the constant compass course between two points is a straight line.[61] If this interpretation is correct, Wei's work appears to be much more complex than many European atlases of the time. But the choice of projections may have been made for Wei Yuan by the sources available to him. He may have been merely copying European maps. In one of his prefaces he says that he consulted European sources and that he is "providing" maps, not creating them.[62] He does not claim authorship of the maps, and his book provides no evidence that he was aware that different methods of projection existed. Thus it is hard to credit Wei Yuan with understanding projection.

Wei's treatise, however, was not meant primarily as an exercise in cartography. Its purpose was to promote Westernization. Wei advocated adopting European technol-

1978), 1:7. This is the third edition of the *Haiguo tuzhi*, originally published in 1844.

61. See Lu, *Zhongguo dituxue shi*, 203 (note 1).

62. Wei Yuan, "*Haiguo tuzhi* hou xu" (Postface to the *Haiguo tuzhi*), 3a, in *Zengguang Haiguo tuzhi*, 1:9 (note 60).

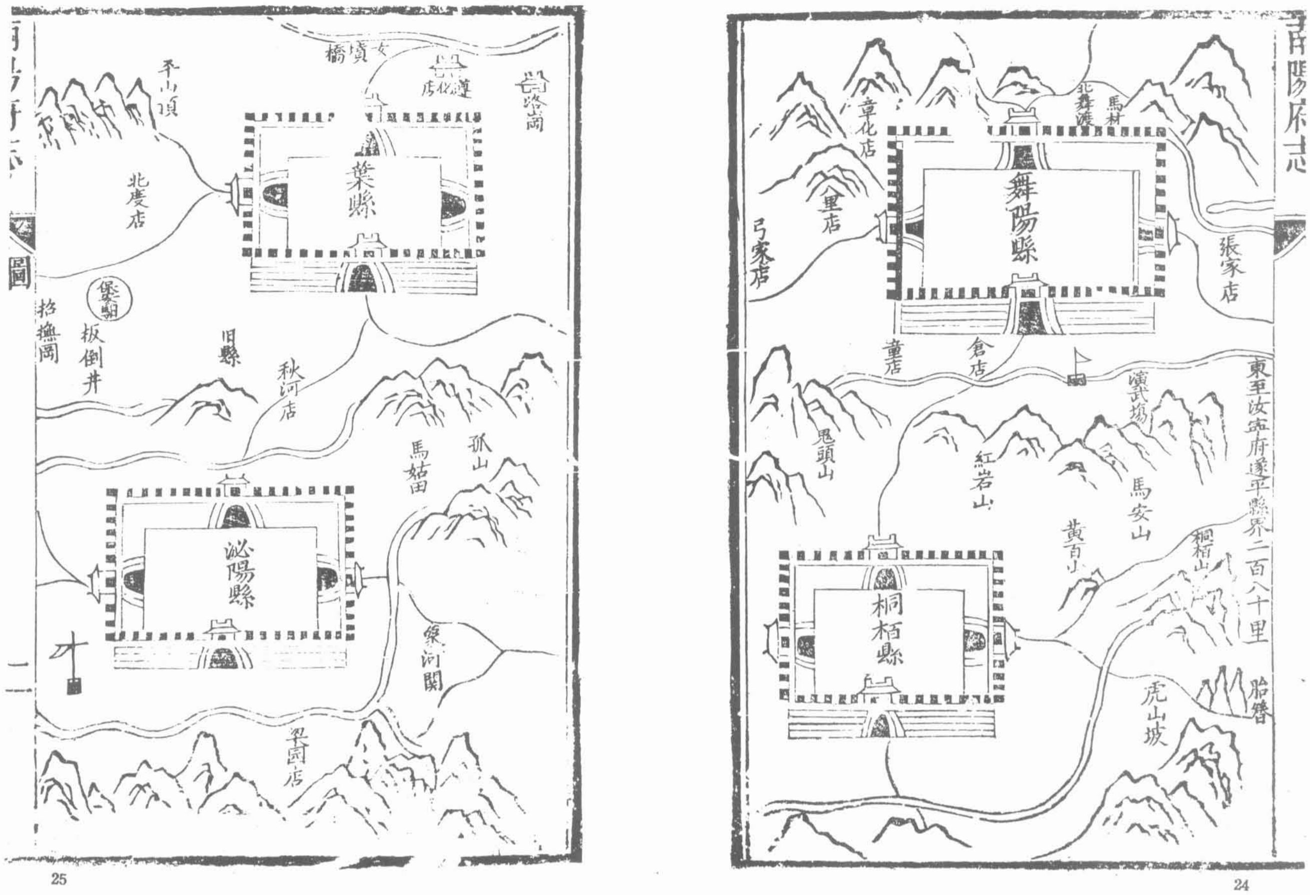

FIG. 7.17. MAP FROM THE *NANYANG FU ZHI*.
Size of each page: ca. 16.5 × 10.5 cm. From *Nanyang fu zhi* (Gazetteer of Nanyang Prefecture [in present-day Henan Province]) (1694; reprinted Taipei: Taiwan Xuesheng Shuju, 1968), *tu* 1b–2a.

ogy, particularly in the manufacture of arms and naval vessels, and encouraged the study of European technology. These and other reforms that he put forth as a means of dealing with maritime "barbarians" struck a responsive chord in China and abroad. His work was, for example, translated into Japanese and influenced Japanese views on Westernization.

The need to realize at least some of Wei's proposals became apparent to a number of Chinese intellectuals in the second half of the nineteenth century. During that period China experienced a series of domestic rebellions, among them the Taiping Rebellion, a movement inspired by Christian ideology to expel the Manchus from China. China also suffered setbacks in border disputes—setbacks attributable to a lack of solid geographic information.[63]

As a consequence of a growing sense of national weakness, reformers urging Westernization gained strength in the central government, and they did succeed in promoting the development of industry and communications. Chinese intellectuals also saw mapping practice as needing improvement. The deficiencies of Qing predecessors are admitted by the compilers of a gazetteer dating from 1879: "As far as maps are concerned, the Kangxi edition of this gazetteer is too sketchy, and the distances and locations of mountains, streams, and cities and their outskirts are topsy-turvy and confused. We rechecked the area following those maps, from beginning to end, and there was not one correct place. This is probably a result of clerks and laborers being delegated the task, while [those in charge] did not personally pass through the area

63. The growth of Manchu power coincided with the expansion of the Russian empire across what is now Siberia and into the Amur (Heilongjiang) basin, where tension arose between the two empires. In this confrontation the Qing empire ended up with a loss of territory attributable to errors in surveying and mapping. On the Qing border dispute with the Russian empire, see Joseph Sebes, *The Jesuits and the Sino-Russian Treaty of Nerchinsk (1689): The Diary of Thomas Pereira, S.J.* (Rome: Institutum Historicum S.I., 1961); and John Robert Victor Prescott, *Map of Mainland Asia by Treaty* (Carlton, Victoria: Melbourne University Press, 1975). The Qing also lost territory in border disputes with the Koreans as a result of faulty geographic information. For a detailed study, see Zhang Cunwu, "Qingdai Zhong-Han bianwu wenti tanyuan" (An inquiry into the Sino-Korean border question during the Qing dynasty), *Zhongyang Yanjiuyuan Jindaishi Yanjiusuo Jikan* 2 (1971): 463–503.

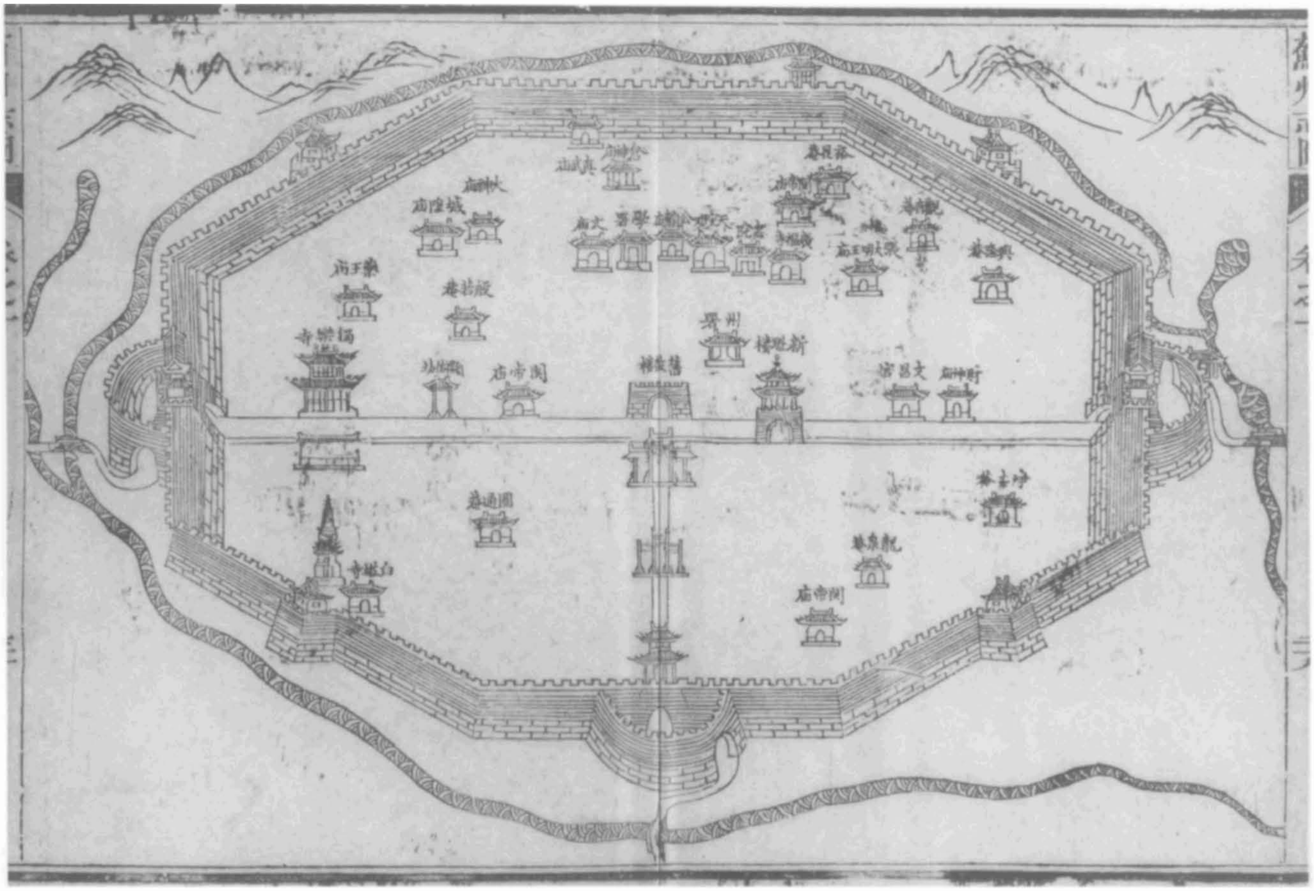

FIG. 7.18. MAP FROM THE *JIZHOU ZHI*.
Size of the original: 19.5 × 29 cm. From *Jizhou zhi* (Gazetteer of Jizhou [in present-day Hebei Province], 1831), 1.29b–30a. Reproduced courtesy of the Harvard-Yenching Library, Harvard University, Cambridge.

and conduct a detailed examination."[64] As a corrective, the compilers of the 1879 gazetteer based their information on trips personally undertaken or delegated to scholars who took notes on the places they passed.

Such care in the recording of information, however, seems to have been exceptional among compilers of local gazetteers even during the late Qing. In the 1890s the central government felt compelled to try to standardize the cartographic practices of regional and local administrations. During that time, the *huidianguan* (bureau of institutional studies) was compiling a new atlas of the empire. Provincial governments were asked to submit maps based on measurements of distances and of latitude and longitude and to submit provincial maps using conic projections. The attempt at standardization failed in large part because of a shortage of scholar-officials knowledgeable in surveying techniques. In 1892 a provincial governor memorialized the throne, lamenting that there was no way to adhere to the new standards: "In each subprefecture and county, scholars familiar with the territory are extremely few. In addition, there are no surveying or drawing instruments. For this reason, things are confused and there is no way to proceed."[65]

It is not known how many Chinese were competent enough to apply European techniques on their own. Those who produced Western-style maps in the late Qing tended to base them on the Jesuit atlases compiled during the reigns of the Kangxi and Qianlong emperors.[66] Sometimes they imitated European maps without much understanding. A manuscript map of the Eastern Hemisphere drawn in 1790, for example, lacks the lines of latitude and longitude (plate 15). Instead, the outer portion of the map is labeled with the twenty-four points of the Chinese compass. The mapmaker seems to have erroneously believed that constant compass bearings on a

64. *Yongping fu zhi* (Gazetteer of Yongping Prefecture [in present-day Hebei Province]) (1879; reprinted Taipei: Taiwan Xuesheng Shuju, 1968), "Fanli" (Principles), 2a–b.

65. Zhang Zhidong (1837–1909), *Zhang Wenxiang gong quanji* (Complete works of the honorable Zhang Wenxiang [Zhidong], 1928) (1937; reprinted Taipei: Wenhai Chubanshe, 1970), 31.12b–13a.

66. An example of such a compilation is the *Da Qing yitong yutu* (Comprehensive geographic map of the Great Qing, 1863), which is discussed below.

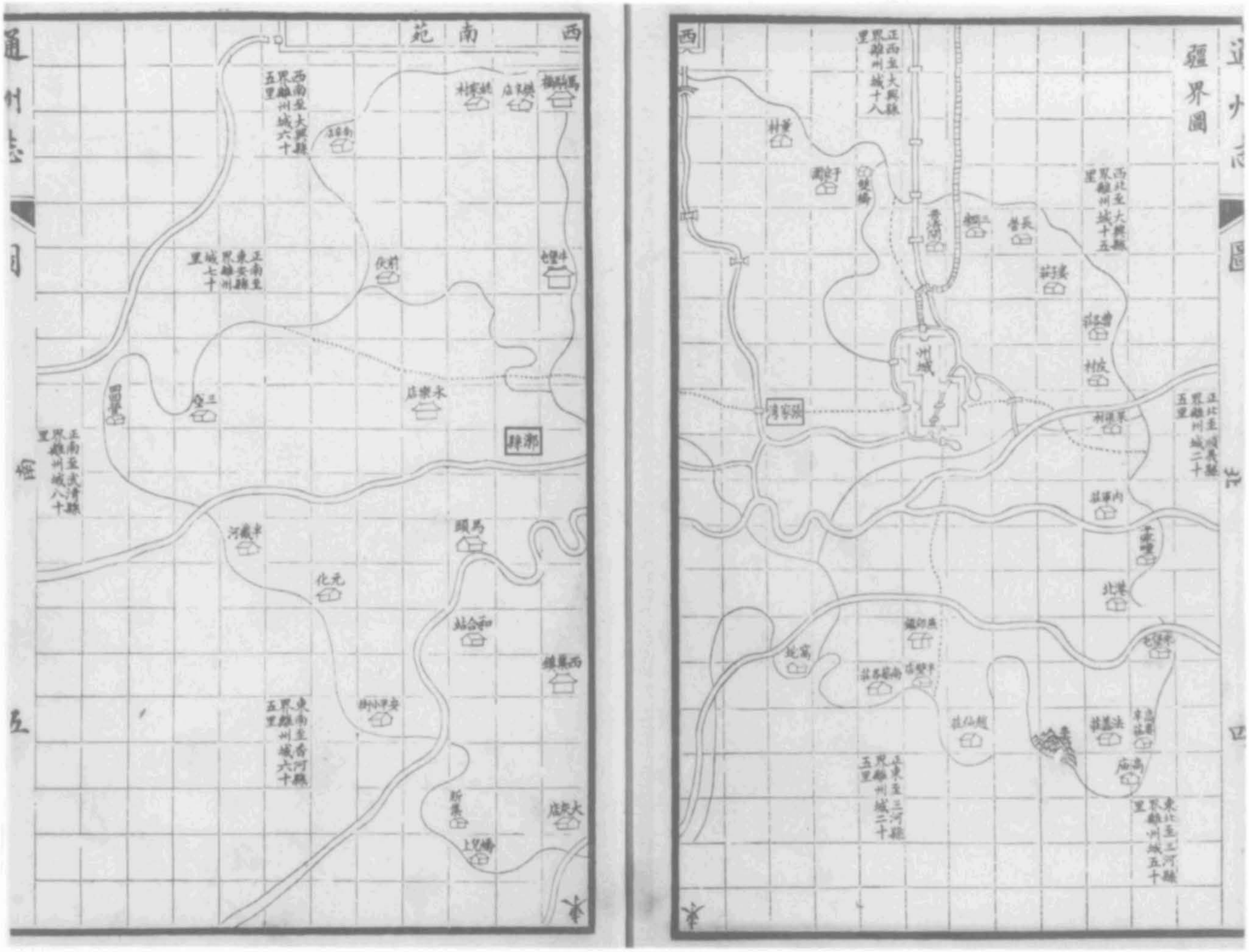

FIG. 7.19. MAP FROM THE *TONGZHOU ZHI*.
Size of each page: 22.5 × 14.5 cm. From *Tongzhou zhi* (Gazetteer of Tongzhou [in present-day Hebei Province, near Beijing]) (1879), *tu* 4b–5a. Reproduced courtesy of the Harvard-Yenching Library, Harvard University, Cambridge.

spherical earth lay on a straight line.

In some quarters Pei Xiu (223–71), whose six principles seem to have presupposed a flat earth, was still upheld as the model of cartographic practice. The compilers of a gazetteer dating from 1894 say that old gazetteer maps are crude in their technique, since they often do not use grids: "Now we follow the methods of Pei Xiu of the Jin dynasty."[67]

It seems that human nature may also have been a factor in hindering efforts at cartographic reform, if government attempts to rectify cadastral survey practices are any indication. The central government did try to establish a system of tax accounting based on registers and cadastral maps. But the use of maps and registers was insufficient to maintain fiscal soundness. During the eighteenth century, in the Jiangnan region (Jiangsu, Jiangxi, and Anhui), for example, large landowners were able to circumvent the tax collection despite the use of maps and registers. They would, as Zelin has found, often "divide their holdings into several tens or even several hundreds of different household registrations, each claiming a minute amount of land":

> The name of the household heads for each of these *hu* [households] would be falsified, using the names of dead ancestors, people who had migrated from the area, temple names, and so on. Ownership of the land was rendered difficult to trace, and the small amount of arrears from each *hu* discouraged investigation. Even if they were found out, their familiarity with the

67. *Guangping fu zhi* (Gazetteer of Guangping Prefecture [in present-day Hebei Province]) (1894; reprinted Taipei: Taiwan Xuesheng Shuju, 1968), "Fanli" (Principles), 1a–b. For more on Pei Xiu, see esp. pp. 110–13.

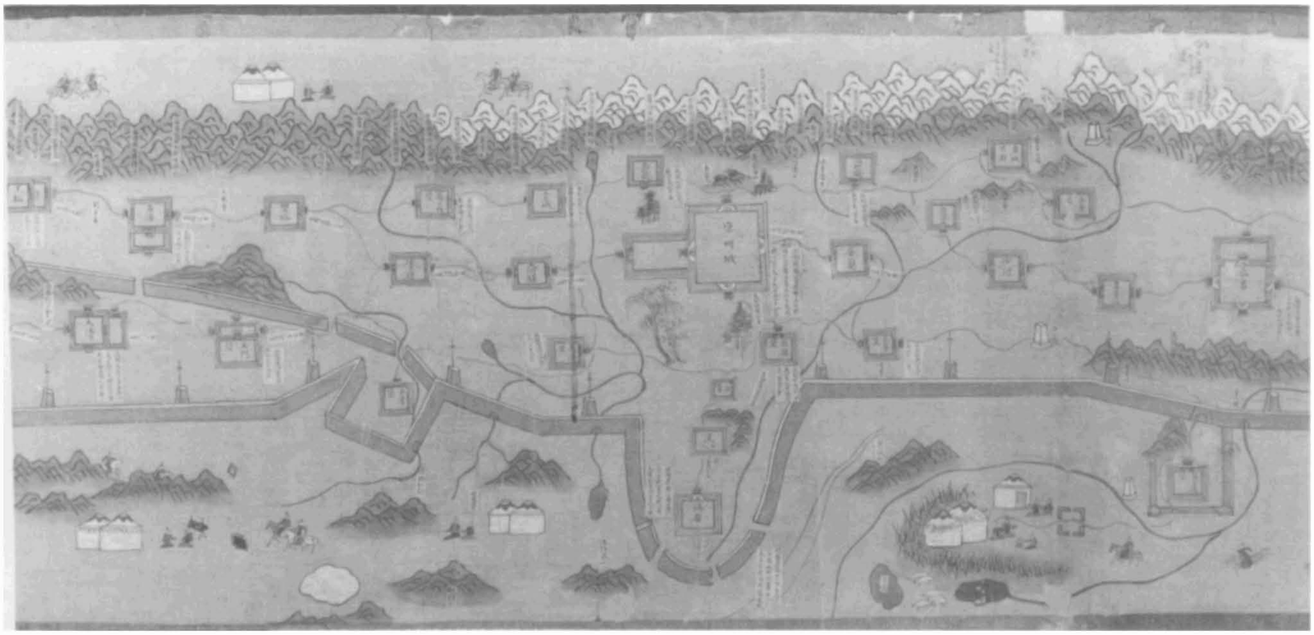

FIG. 7.20. LATE SEVENTEENTH-CENTURY MAP OF THE GREAT WALL (DETAIL). Size of the entire original: 22.5 × 755 cm. By permission of the Monumenti Musei e Gallerie Pontificie, Vatican City.

FIG. 7.21. NINETEENTH-CENTURY MAP OF THE YELLOW RIVER. Size of the original: 38 × 182 cm. Courtesy of the Geography and Map Division, Library of Congress, Washington, D.C. (G7822.Y4A5 18--.H9 Vault Shelf).

> malpractices of officials and clerks and their own influence in the community allowed the rural elite to blackmail the regular bureaucracy into granting them almost total immunity from taxation.[68]

Officials hoped that the use of maps and registers would simplify tax collection procedures. But they underestimated the resourcefulness of tax evaders and the venality of local bureaucrats, who would often alter, hide, or even destroy maps and registers so that the amount of taxes in arrears would be nearly impossible to determine.

The lack of consistent practices among provincial governments posed problems to the mapmakers at the *huidianguan*. Because maps submitted by provincial governments were drawn according to different standards, the bureau complained, it was difficult to combine these maps into a comprehensive map of the entire empire without incurring error. After rechecking measurements and consulting textual sources, the ***huidianguan*** redrew the maps submitted, adopting the following practices as a standard:

> The bureau now . . . uses the method of conical projection for the complete imperial map, without a grid. For the general maps of provinces, a grid with increments representing one hundred *li* is used; and for the individual maps of each prefecture, a grid with increments representing fifty *li* is used. Both of these lack longitude and latitude. The general maps include only the most important information, such as famous mountains and rivers, places where local governments

68. Madeleine Zelin, *The Magistrate's Tael: Rationalizing Fiscal Reform in Eighteenth-Century Ch'ing China* (Berkeley and Los Angeles: University of California Press, 1984), 245.

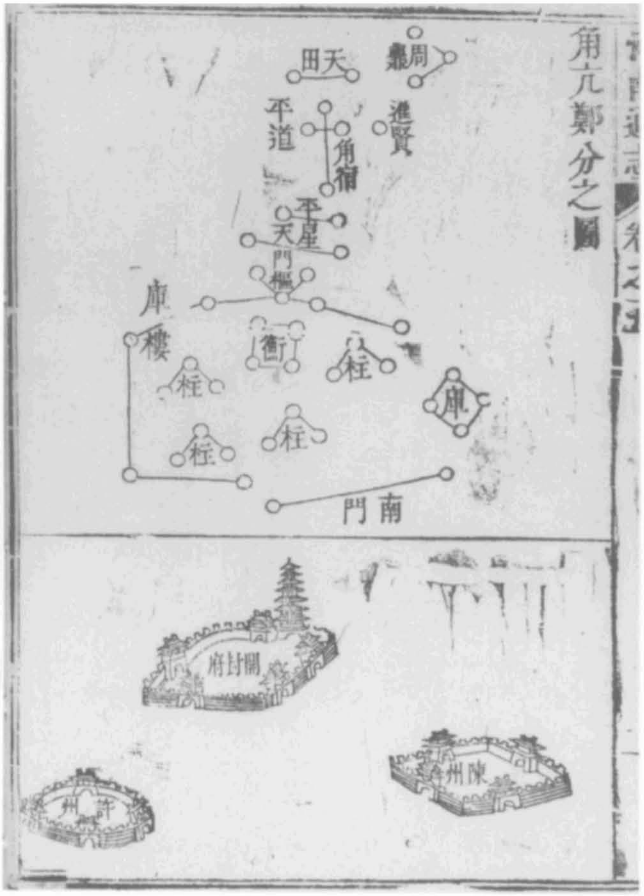

FIG. 7.22. ASTROLOGICAL DRAWING FROM A QING GAZETTEER OF HENAN PROVINCE. Chart of the celestial field over Kaifeng Prefecture.
Size of the original: 22.5 × 16 cm. From *Henan tongzhi* (1882; rev. ed. 1869), 5.1b. Reproduced courtesy of the Harvard-Yenching Library, Harvard University, Cambridge.

> are located, and public and private telegraph lines. Prefectural maps, on the other hand, attempt to be as detailed as possible, including all the mountains, rivers, villages, towns, courier stations, mountain passes, seaports, and islands. As a rule, the general maps should observe the degrees [of latitude and longitude]; and the regional maps should observe the *li* [of distance], so that the general and regional complement each other and present all perspectives. The general provincial maps should be concise, and the prefectural maps greatly detailed.[69]

The bureau's standards draw much from European cartography in their advocacy of the graticule and the tendency toward planimetric representation. Pictorial elements were minimized with the bureau's adoption of a set of standard signs for administrative units and topographic features (see fig. 7.25). In accordance with its announced standards, the *huidianguan* published a map of the empire (fig. 7.26). Not all the signs it adopted, however, were employed—for example, the sign for telegraph lines. In its standards, the bureau also made some concessions to the continued reverence for traditional Chinese cartographic practices, particularly in the continued use of the square grid (fig. 7.27). This was not a new development. Some Chinese mapmakers even before this time often combined grid with projection, demonstrating an imperfect grasp of the principles behind the idea of projection. The two systems are incompatible—a grid of squares each representing equal increments of distance cannot simply be superimposed on a projection from sphere to plane, in which degree increments do not necessarily translate into equal increments of distance.

The use of grid and graticule may itself have been a result of one tendency within the Chinese reform movement—that toward combining Chinese and European learning. This tendency was embodied in the slogan *Zhongxue wei ti, Xixue wei yong* (Chinese learning as the principle, Western learning as the application). The impulse to fuse the two cultures is evident in the statement of principles for the *Da Qing yitong yutu* (Comprehensive geographic map of the Great Qing, 1863). The mapmakers think highly both of old Chinese methods and of the methods represented by the Kangxi atlas and attempt a synthesis of the two. They see the Kangxi atlas as falling within the Chinese tradition of mapping, not as a departure from it.[70] The compilers of the atlas intend that it should represent "distances as a bird flies," that is, as straight lines—therefore the use of the square grid. They are also aware of the Kangxi emperor's linking Chinese units of distance to a degree of longitudinal arc—"two hundred *li* are equal to one degree of longitude [at the equator]"—thus the use of projection.[71] The Chinese method, however, seems to form the *ti* (the body or principle) of the atlas, since the square grid is printed in solid black lines. The horizontal lines correspond to parallels of latitude, but the meridians are indicated with broken lines.

The atlas consists of more than one hundred leaves, which can be assembled to form four sheet maps: two small maps consisting of a few leaves, one of Vietnam and one of Taiwan; and two large maps, one of mainland China with Hainan and one of Asia extending east to

69. *Qinding Da Qing huidian* (Imperially commissioned, collected statutes of the Great Qing), 24 vols. (1899; reprinted Taipei: Zhongwen Shuju, 1963), "Fanli" (Principles), 2:1024–25.

70. This response to European science was common among Qing intellectuals, who often sought precedents for European ideas in traditional texts.

71. Hu Linyi et al., comps., *Da Qing yitong yutu* (1863; Shanghai: Shanghai Shuju, 1896), "Fanli" (Principles), 7b–8a. This work is also known as the *Huangchao Zhongwai yitong yutu* (Comprehensive geographic map of China and foreign countries of the present dynasty).

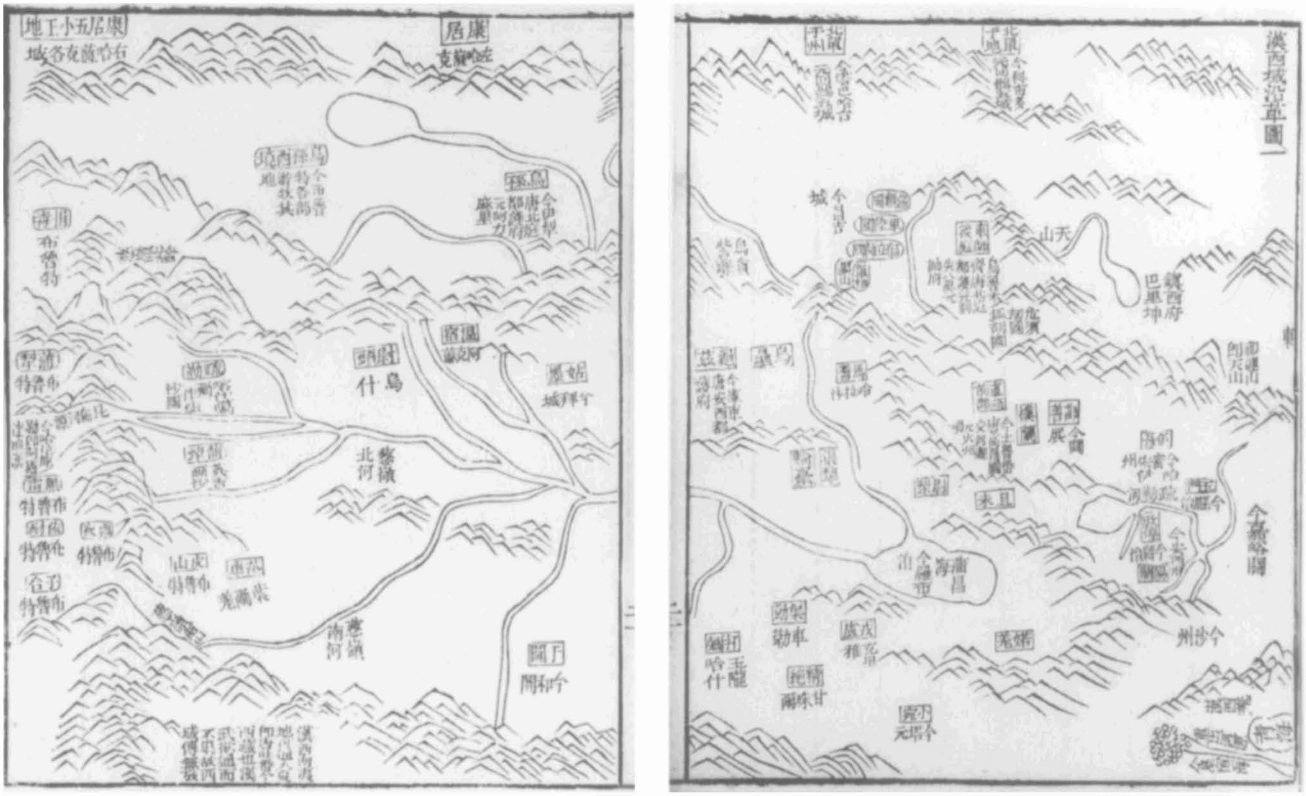

FIG. 7.23. HISTORICAL MAP BY WEI YUAN. Map of the Western Region during the Han dynasty.
Size of each page: 21 × 12.5 cm. From Wei Yuan, *Zengguang Haiguo tuzhi* (Expanded Illustrated record of maritime kingdoms), from an edition of 1847, 3.7a–b. Reproduced courtesy of the Harvard-Yenching Library, Harvard University, Cambridge.

west from the Pacific Ocean to the Caspian Sea and north to south from the Arctic Ocean to Indochina and India. In the 1896 edition of the atlas, the leaves making up the comprehensive map of East Asia are printed so that each leaf covers four degrees of latitude (or about eight hundred *li*) and each grid increment along the vertical axis corresponds to one-half degree or one hundred *li*. Each square is thus supposed to represent ten thousand square *li*. This would be the case if a flat surface were being mapped, but as the meridians drawn on the maps remind a map reader, the map is actually a projection from a spherical surface to a plane—in this case trapezoidal projection, since the Kangxi atlas was used as a base. In the process of projection some distortion occurs. For example, north and south bearings do not always correspond to the vertical axis of the grid. As one moves away from the prime meridian running through Beijing, the meridians become increasingly oblique, so that the north-south axis is no longer perpendicular to the east-west axis (see fig. 7.28). In addition, with the trapezoidal projection, the scale of one grid increment to one hundred *li* would be true only along the prime meridian and one or possibly two base parallels. For the remainder of the map, the determination of direct distances between points would not be a simple matter of counting squares.

The production of hybrid maps combining grid and graticule in the late nineteenth century casts doubt on Needham's assertion that during the Qing dynasty Chinese cartography had become part of "world" cartography, or one with European cartography. The evidence presented here suggests a different conclusion—that traditional Chinese cartography continued to flourish under Manchu rule, despite the employment of foreign cartographers for imperial mapping projects. The mere fact of transmission does not always translate into reception, and the case of European cartography in China illustrates this point.

Chinese cartography during the late imperial period was much more complex than allowed by those who have focused on the Jesuit surveys. How complex is something that is just now beginning to be appreciated. Contrary to many accounts of Chinese cartography, European influence did not mean the end of the indigenous tradition. It was, the evidence examined so far suggests, actually dominant for much of the late imperial period.[72]

72. Furthermore, the textual scholarship underlying much traditional Chinese cartography also flourished. See esp. pp. 92–95.

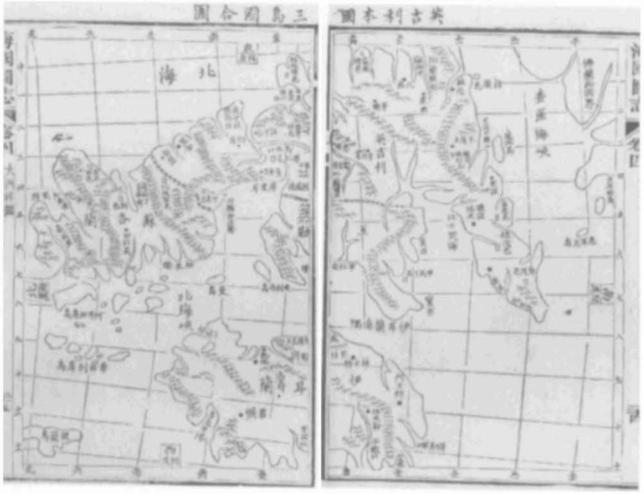

FIG. 7.24. MAP OF THE BRITISH ISLES BY WEI YUAN. The prime meridian falls to the east of London. East is at the top.
Size of each page: 20.5 × 14 cm. From Wei Yuan, *Zengguang Haiguo tuzhi* (edition of 1876), 4.24b–25a. Reproduced courtesy of the Harvard-Yenching Library, Harvard University, Cambridge.

The history of European cartography in China was not a case of a dominant culture imposing its science on a weaker recipient. The response of Chinese cartography to the European model was similar to that of Chinese astronomy: mapmakers, like astronomers, as Sivin says, were "on the whole members of the old educated élite, imbued with its values. Their first impulse was to supplement and strengthen the indigenous science, not to discard it, and their loyalty remained with their ancestral world view."[73]

73. Sivin, "Copernicus in China," 64 (note 47).

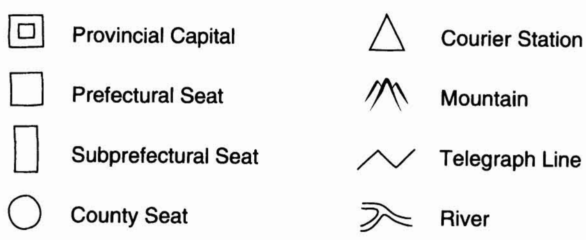

FIG. 7.25. STANDARDIZATION OF MAP CONVENTIONS DURING THE LATE QING. Standard symbols adopted by the *huidianguan* (bureau of institutional studies).

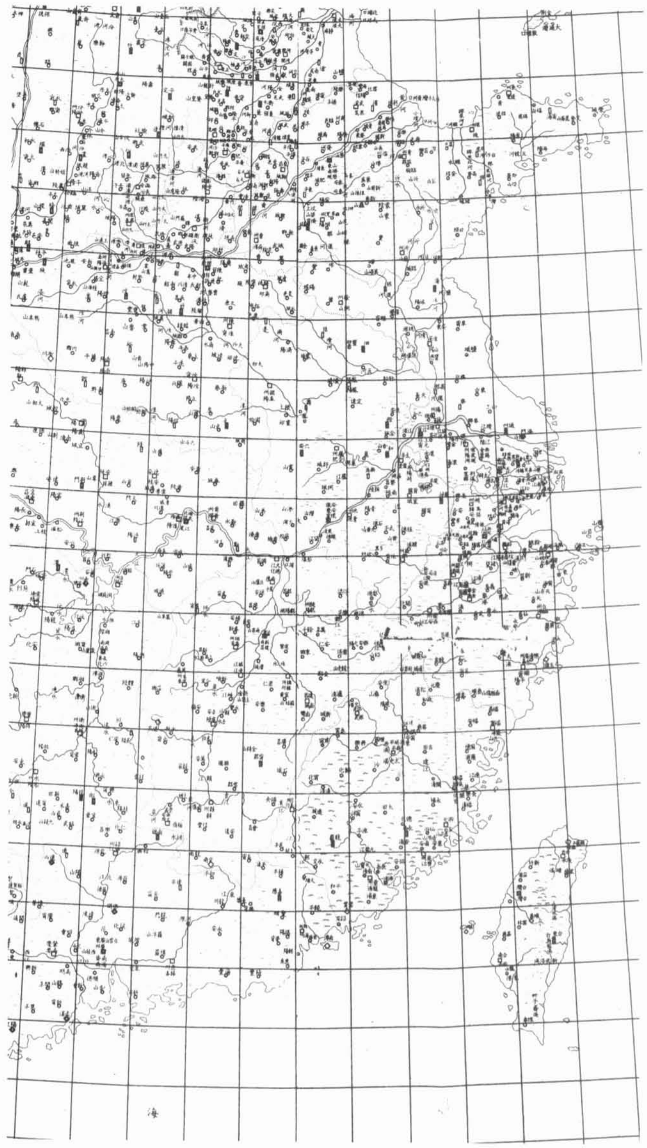

FIG. 7.26. DETAIL FROM "HUANGYU QUANTU" (COMPLETE MAP OF THE EMPIRE, 1899). This map of the empire was drawn using a conical projection. The prime meridian passes through Beijing. The entire map represents an area extending 47° east and 47° west of Beijing (from west of present-day China to about the Kamchatka peninsula) and extending between 18° and 61° north latitude (from Hainan Island to about midway through Siberia). The portion reproduced here shows the eastern part of China.
Size of the entire original: 114.9 × 185.2 cm. From the *Qinding Da Qing huidian* (Imperially commissioned, collected statutes of the Great Qing), 24 vols. (Beijing: Huidianguan, 1899).

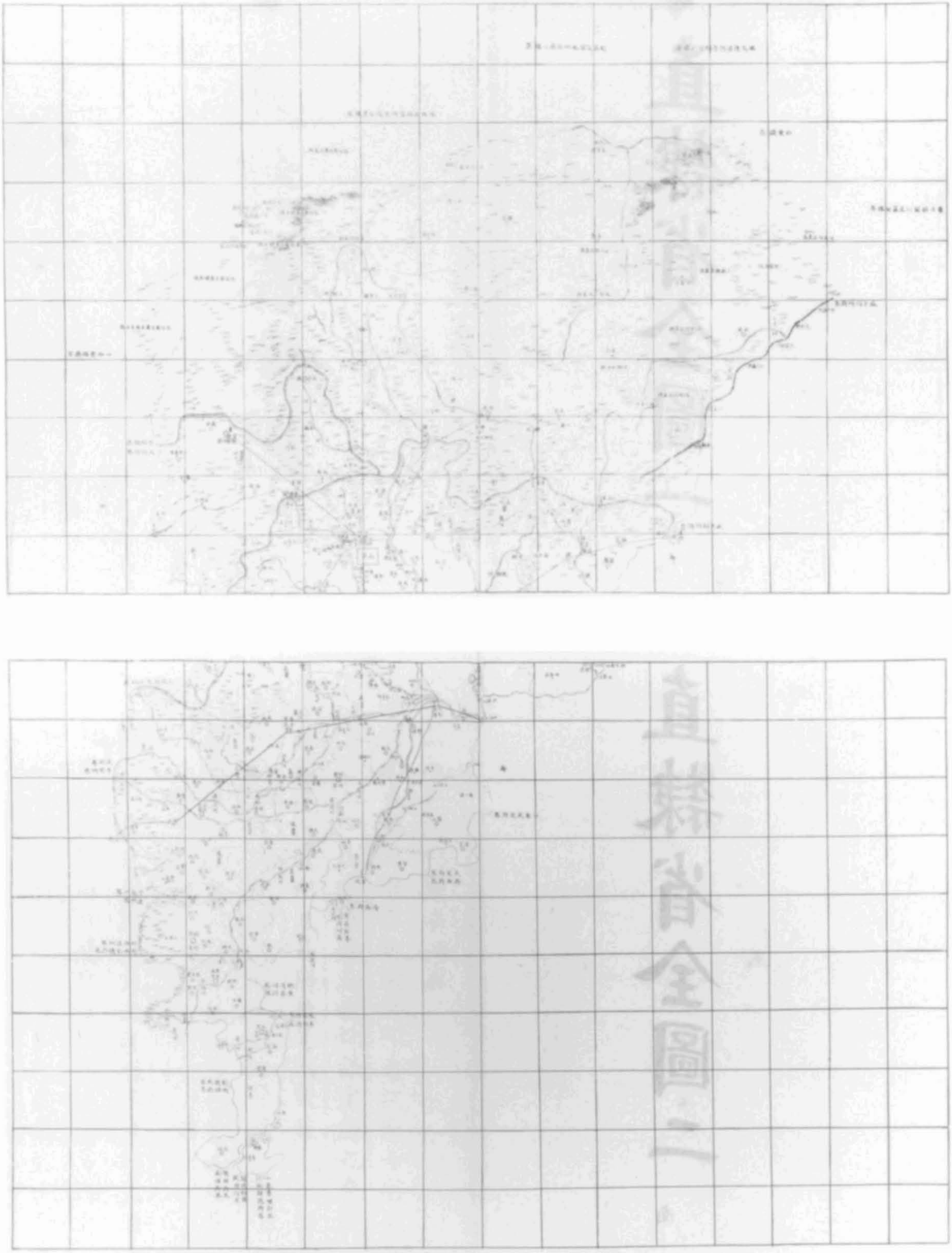

FIG. 7.27. MAPS OF ZHILI, PROVINCIAL SEAT OF THE IMPERIAL GOVERNMENT. These maps present two parts of Zhili. The grid was intended in part to help line up the images on the two maps, but because of discrepancies in the sizes of the squares, the two images do not match precisely. Above, northern Zhili; below, southern Zhili.
Size of the images: 18.9 × 30.4 cm and 18.6 × 29.9 cm. From the *Qinding Da Qing huidian*, 24 vols. (Beijing: Huidianguan, 1899).

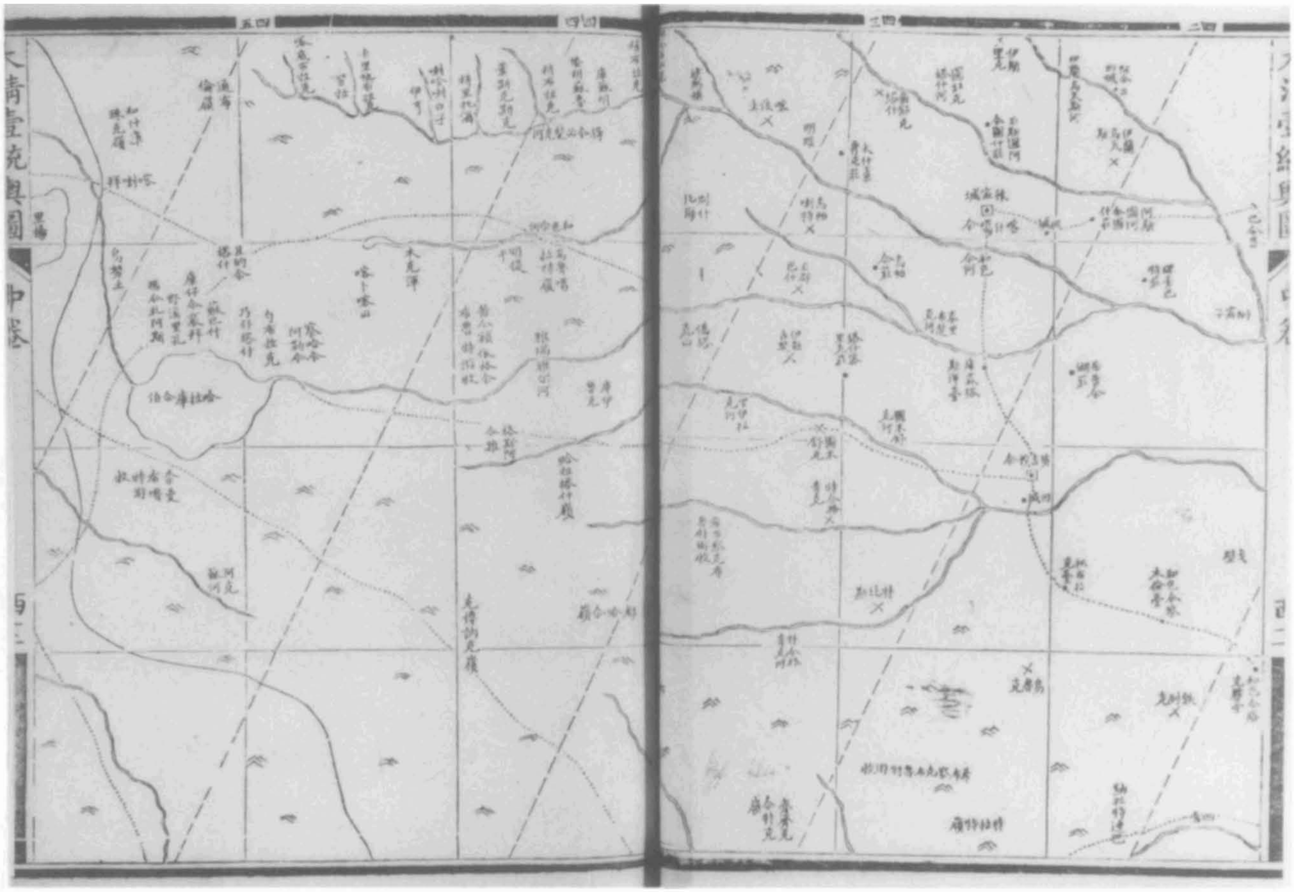

FIG. 7.28. MAP COMBINING GRID AND GRATICULE. The meridians become more oblique as one moves away from the prime meridian running through Beijing. Although the map employs a projection, the grid gives the impression that one can measure direct distances between points along a straight line. This section of the map depicts part of the Kashgar region. Size of each page: 22.5 × 18 cm. From Hu Linyi et al., comps., *Da Qing yitong yutu* (1863), chap. *zhong*, *xi* 11b–12a. Reproduced courtesy of the Harvard-Yenching Library, Harvard University, Cambridge.