3 · Reinterpreting Traditional Chinese Geographical Maps

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My interest in this chapter and the following four is traditional Chinese geographic mapping—that is, Chinese mapping of the earth before its Westernization in the late nineteenth and early twentieth centuries. One of the first lessons one learns when studying this subject is that the traditional periodization used in scholarship is unsatisfactory. The traditional scheme takes the rise and fall of China's ruling houses as constituting distinct periods (see table 2.1). Such a scheme may have been useful for organizing material dealing with political and institutional history, and as will be seen in a later chapter, cartography was intimately connected to that history. But cartographic developments do not neatly parallel changes in politics. Historians of cartography in the past, however, have tried to tie cartography to dynastic changes in ways I have found misleading. For example, Wang Yong, a pioneer in the study of traditional Chinese maps, once claimed that Tang (618–907) cartography was superior to that of the Song dynasty (960–1279), even though virtually no cartographic artifacts from the Tang are extant.[1] Other writers have made similar claims: that the Yuan (1279–1368) and Ming dynasties (1368–1644) represent the high point of Chinese cartography, that scientific cartography in China began in the third century or as early as the Former Han (206 B.C.–A.D. 8)—depending on one's sources. Given that we have only a handful of artifacts that warrant cartographic interest for the period from the first through the tenth century, these claims seem overconfident. That such claims are made at all suggests there are at least two major premises underlying them: that history is best seen as a march of progress through a generally ascending series of high points; and as a corollary, that cartographic history is best seen as a movement toward increased mathematization or quantification—toward cartography in its modern manifestation.

In this book I am questioning these premises, and one of the results of this questioning is the organization of the material. For the most part I have chosen to arrange the material thematically. I believe this is the best way to carry out searching examinations of the questions raised by the maps and other sources—inquiries that might be limited if we were forced to keep dynastic time frames in mind. These extended inquiries are obtained at some cost, however. With a thematic approach one risks losing a clear sense of chronology, and one sacrifices the power of narrative to maintain a sense of direction. By keeping the focus on ideas or themes, one also risks losing sight of the maps themselves. Detailed descriptions of artifacts can disrupt the flow of an argument or at least make it harder to follow, and so in the thematic chapters that follow this one, artifacts are dealt with in only as much detail as is necessary to support the arguments presented.

The loss of chronology and detail would be regrettable, especially when at least part of the audience for this book—collectors and cartobibliographers, for example—could reasonably be expected to take an interest in such matters. One of the aims of this opening chapter, therefore, is to discuss artifacts in greater detail than elsewhere in this section and to give some sense of their chronology.

We should remember that, in an important sense, the history of Chinese cartography has yet to be written. There are large gaps in the artifactual record. Between the Later Han (25–220) and the end of the ninth century, for example, there are almost no maps. For the Ming and Qing periods (1644–1911) one faces the opposite problem: a superabundance of maps. The primary source material on the cartography of these periods outbulks that of all previous dynasties combined. In addition to thousands of maps in the imperial archives and thousands of gazetteers, there are collections of memorials and other documentary material that need to be examined for evidence of map use within the Ming and Qing administrations. Thus there are abundant opportunities for further research (see appendix 3.1).

I would like to acknowledge the help of Kevin Kaufman and the coeditors of the *History of Cartography* in the preparation of this chapter.

1. Wang Yong, *Zhongguo dilixue shi* (History of geography in China) (1938; reprinted Taipei: Shangwu Yinshuguan, 1974), 70, 74. Chavannes made similar claims, saying that advances in cartography were made during the Tang. See Edouard Chavannes, "Les deux plus anciens spécimens de la cartographie chinoise," *Bulletin de l'Ecole Française d'Extrême Orient* 3 (1903): 214–47, esp. 244.

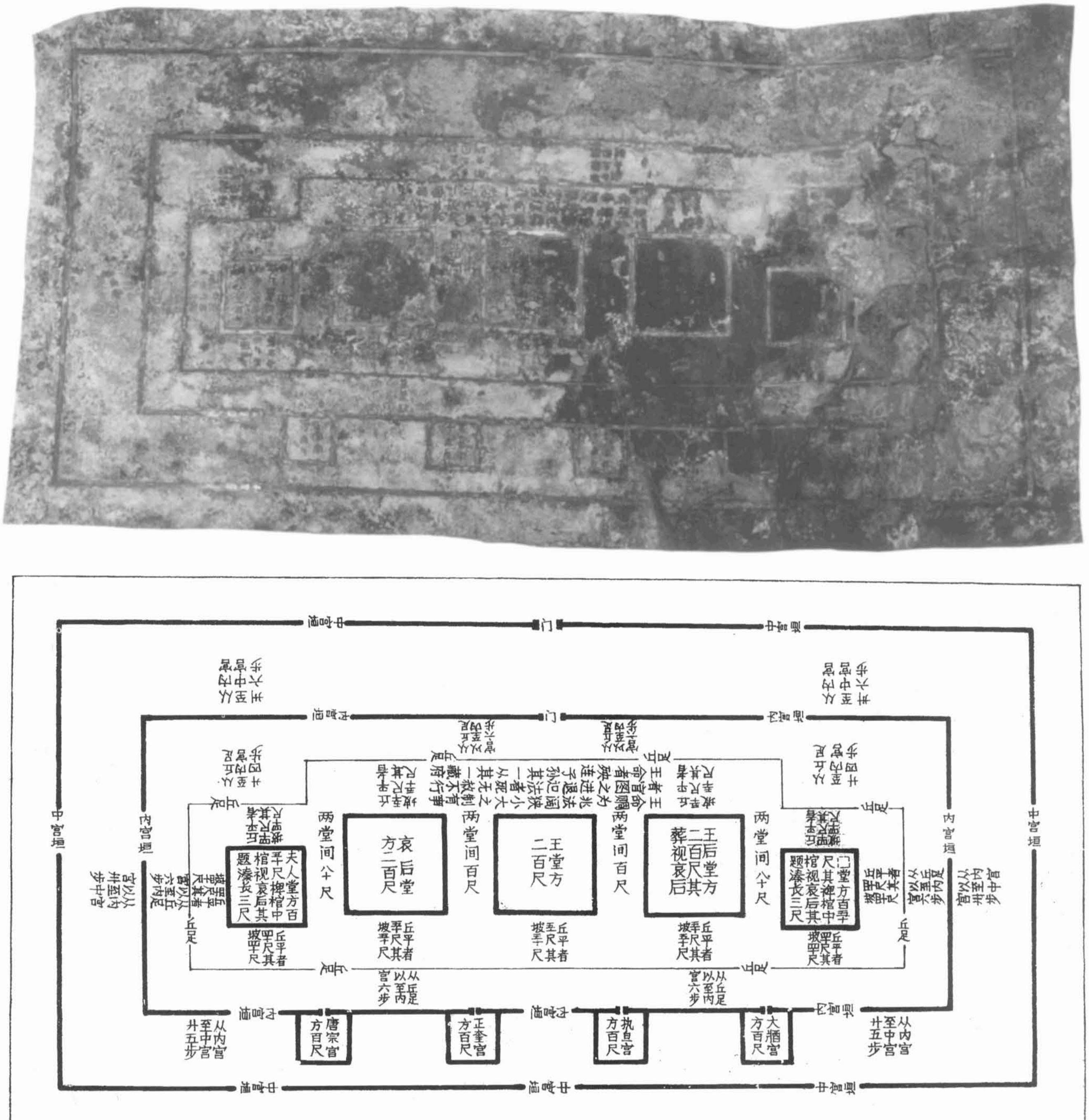


FIG. 3.1. *ZHAOYU TU* ENGRAVED ON BRONZE. Notes on the map give dimensions of the mausoleum in terms of *chi* (feet) and *bu* (paces). The *chi* is thought to have been equal to twenty-two or twenty-five centimeters, while estimated values for the *bu* range between five and seven *chi*. Below is a reconstruction of the *zhaoyu tu* with modern Chinese graphs. The original bronze plate bears graphs in their archaic form. Size of the original: 48 × 94 cm (ca. 1 cm thick). Photograph courtesy of China Pictorial Publications, Beijing. Reconstruction from Cao Wanru et al., eds., *Zhongguo gudai ditu ji* (Beijing: Wenwu Chubanshe, 1990–), vol. 1, fig. 3.

In this chapter, artifacts through the fourteenth century are well represented, since they are relatively few. For later periods the coverage is somewhat more selective, since maps from those periods, especially the Qing, are discussed more fully later in this section as part of an examination of the Westernization of Chinese cartography.

The descriptions in this chapter are not provided solely for the sake of presenting artifacts or for the sake of chronology. Those purposes are subordinate to another one: to introduce some of the themes and issues explored in depth in the chapters that follow. In doing so, I will refer to the artifacts and related documents and show how they raise questions of central concern to historians of cartography—questions that have been largely overlooked.

Chinese Mapping: A Mathematical Tradition?

The previous scholarship on traditional Chinese cartography is characterized by a remarkable unity of approach. It has generally tried to interpret Chinese cartography as a mathematical or quantitative tradition—characterized by attention to scale, conventional abstract signs, and practical function, such as planning, administrative, and military. Mapping so conceived is mathematical in at least two respects. First, it involves quantification and the reduction of topographical features to signs that aid the presentation of quantitative information. Second, it serves purposes that often involve the application of mathematics. If scale, abstract signs, and practical function characterize Chinese mapping, then it might be said to constitute a rational discipline, or science, of cartography. The current literature suggests that a science of cartography developed in China at least by the Former Han and continued through the early Qing, when Chinese cartography became Westernized. The case for a continuous mathematical tradition of Chinese mapping once rested largely on a few textual sources and a few maps, notably the 1136 *Yu ji tu* (Map of the tracks of Yu [legendary emperor famous for flood control]), which Chavannes said was "the result of a long scientific evolution."[2] According to recent scholarship, that case has been strengthened by recent archaeological discoveries. According to the mathematical or quantitative interpretation of traditional Chinese cartography, these artifacts record an inevitably unsuccessful, but nonetheless essentially scientific, attempt to draw maps to scale. The claims of proponents of this interpretation will be submitted to critical analysis. But first I will present the artifactual and textual evidence for this interpretation.

The earliest artifact lacks a title, but Chinese researchers refer to it as the *zhaoyu tu*, which, because of the ambiguity in the graph *tu*, can be rendered as mausoleum map or plan. It was discovered in 1978 in a tomb unearthed in Pingshan Xian (County), Hebei Province.[3] The tomb is that of King Cuo of the Zhongshan kingdom, a small state of the Zhanguo (Warring States) period (403–221 B.C.). He was buried about 310 B.C., so the *zhaoyu tu* dates from at least the fourth century B.C.[4]

The *tu* is engraved on a bronze plate (fig. 3.1). It is oriented with south at the top and is believed to represent a walled area of about 191 by 414 meters.[5] It depicts in plan five sacrifice halls, four smaller buildings, an inner and outer wall, and a baseline marking the foot of the grave mound. These features are represented with lines of gold and silver inlay. The five sacrifice halls were intended to cover the tombs of King Cuo, his two queens, and two other members of the royal family. At the Pingshan site, two tombs have been unearthed, those of King Cuo and Queen Ai. The other three tombs were never built, evidently because several years after the king's interment, the Zhongshan kingdom fell to another state.[6] All this suggests that the *zhaoyu tu* was a plan for construction rather than a map depicting actual structures.

The *tu* is annotated, and the notes include a transcription of a decree issued by the Zhongshan king. This decree was probably responsible for the *tu*'s survival, because it provided for the preservation of the plan: "one [copy] to accompany [the burial] and one to be stored in the archives."[7] The notes on the *tu* also name the objects represented in it and provide linear measurements for the dimensions of the buildings and the distances between them.

The next group of artifacts in the current canon comprises seven maps, drawn in ink on four wooden boards

2. Chavannes, "Les deux plus anciens spécimens," 236 (note 1).

3. The discovery was first reported by the Hebeisheng Wenwu Guanlichu (Hebei Province Cultural Relic Agency), "Hebeisheng Pingshan xian Zhanguo shiqi Zhongshanguo muzang fajue jianbao" (Excavation of the tombs of the Zhongshan kingdom of the Zhanguo period at Pingshan County, Hebei Province), *Wenwu*, 1979, no. 1:1–31.

4. Fu Xinian, "Zhanguo Zhongshan wang Cuo mu chutu di 'zhaoyu tu' ji qi lingyuan guizhi di yanjiu" (A study of the mausoleum map unearthed from the tomb of King Cuo of the Zhanguo period's Zhongshan kingdom and the planning of the mausoleum), *Kaogu Xuebao*, 1980, no. 1:97–118, esp. 97.

5. Yang Hongxun, "Zhanguo Zhongshan wang ling ji zhaoyu tu yanjiu" (A study of the mausoleum of the king of Zhanguo period's Zhongshan kingdom and the mausoleum map), *Kaogu Xuebao*, 1980, no. 1:119–38, esp. 127–29.

6. Liu Laicheng and Li Xiaodong, "Shi tan Zhanguo shiqi Zhongshanguo lishishang di jige wenti" (Tentative discussion of certain problems in the history of the Zhanguo period's Zhongshan kingdom), *Wenwu*, 1979, no. 1:32–36, esp. 33.

7. Hebeisheng Wenwu Guanlichu, "Zhongshanguo muzang fajue jianbao," 5 (note 3).

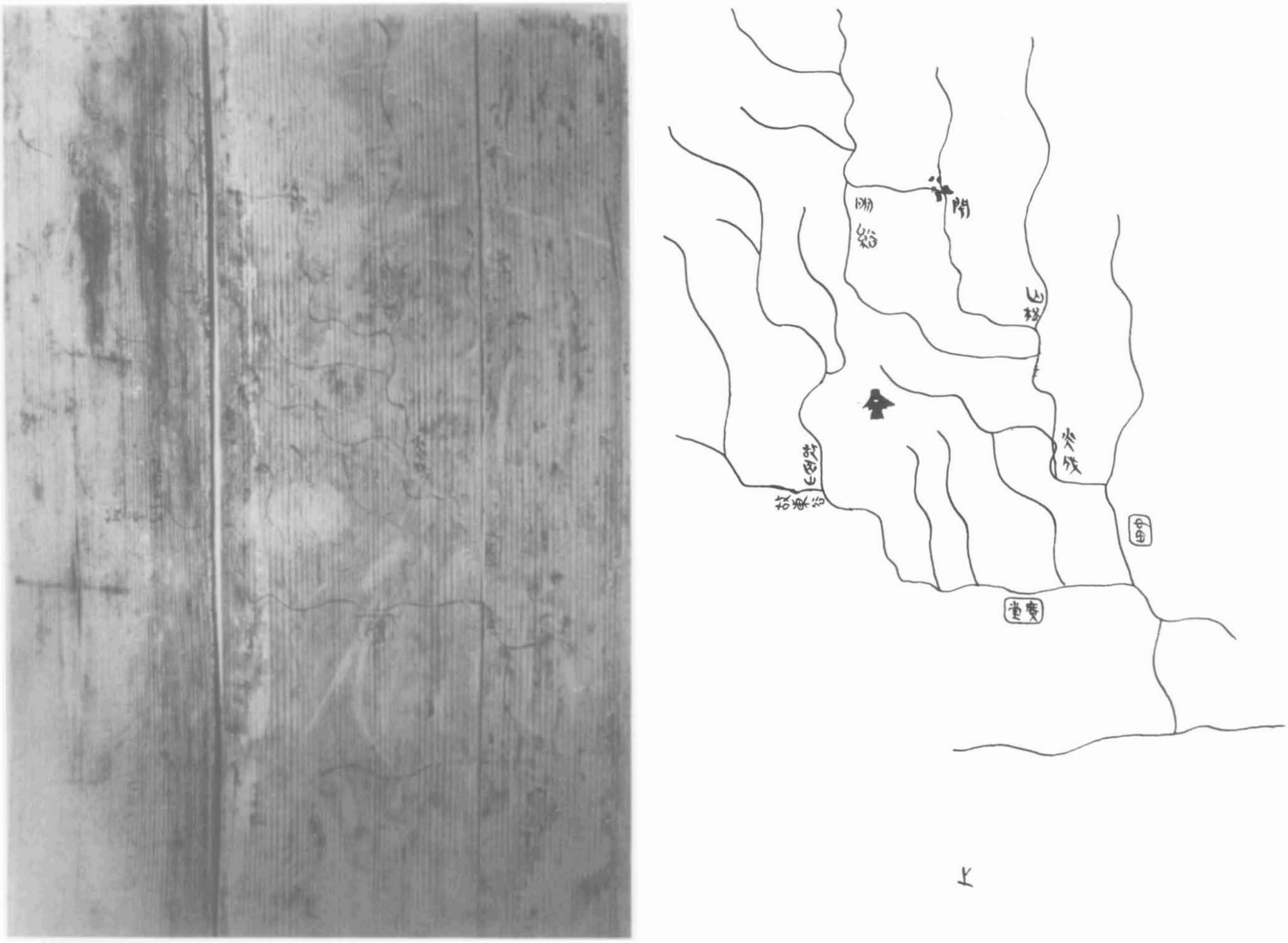


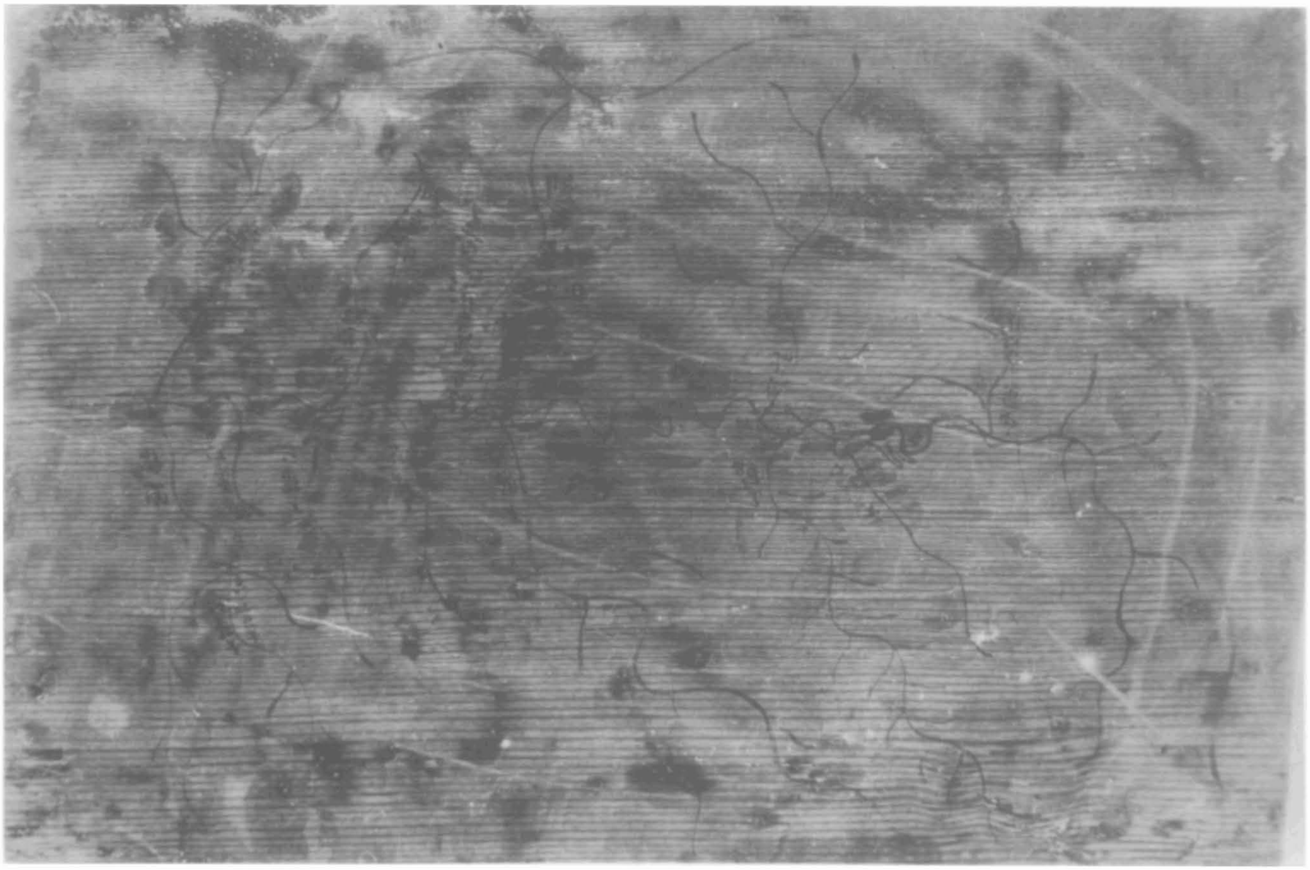
FIG. 3.2. FANGMATAN MAP, VERSO OF BOARD 1. The features represented on the maps found at Fangmatan are primarily linear: mountains, rivers and streams, and roads (see the reconstruction on the right). Some place-names also appear on the maps.

Size of the original: 26.7 × 18.1 cm. By permission of Wenwu Chubanshe. Reconstruction from Cao Wanru et al., eds., *Zhongguo gudai ditu ji* (Beijing: Wenwu Chubanshe, 1990–), vol. 1, fig. 13.

(figs. 3.2 to 3.4). Six of the maps are on both sides of three boards. The maps were discovered in 1986 at Fangmatan forestry station, Tianshui, Gansu Province. They had been buried in a tomb dating from perhaps 239 B.C. and belonging to an officer in the Qin army whose personal name was Dan.[8] The boards on which the maps were drawn are all about one centimeter thick and range in width from 26.5 to 26.8 centimeters and in height from 15 to 18.1 centimeters. The maps all depict parts of the same region, an old administrative district called Gui Xian, which researchers have identified as the Wei River valley and its tributaries, cutting through a section of the Qinling Mountains. This region, which includes the Fangmatan grave site, held strategic importance as a defensible pass through which transportation was funneled from the west into the heart of the Qin state. The maps represent rivers and tributaries by black lines. Gullies, passes, transportation checkpoints, and stands of various kinds of trees, including pine, fir, cedar, and orange, are identified

8. The maps were first described in He Shuangquan, "Tianshui Fangmatan Qin mu chutu ditu chutan" (Preliminary study of the maps excavated from the Qin tomb at Fangmatan in Tianshui), *Wenwu*, 1989, no. 2:12–22.

The date used here follows He Shuangquan's analysis of records on the deceased found in the tomb. The records, on eight bamboo slips, are transcribed in He Shuangquan, "Tianshui Fangmatan Qin jian zongshu" (Comprehensive account of the Qin bamboo slips from Fangmatan in Tianshui), *Wenwu*, 1989, no. 2:23–31, esp. 28–29. The records note that Dan, who served as a military officer and participated in a northern campaign, injured someone in the face and afterward killed himself. He was buried outside the city and came back to life three years later. The records mention years but do not identify the reigning monarch. They suggest, however, that the ruler reigned for at least ten years. It is possible to date the tomb earlier than 239 B.C. as proposed by He Shuangquan. Zhang Xiugui, for example, would push the date of the tomb back to around 300 B.C. by identifying a Qin ruler who also ruled for at least ten years and launched northern expeditions. See Zhang Xiugui, "Tianshui 'Fangmatan ditu' di huizhi niandai" (Date of the maps from Fangmatan, Tianshui), *Fudan Xuebao*, 1991, no. 1:44–48.



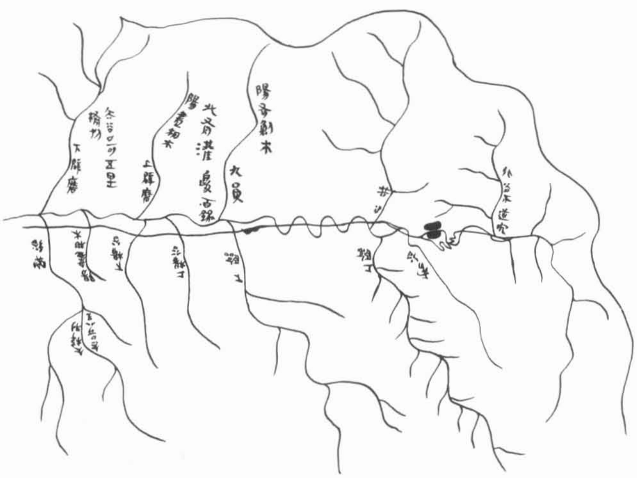


FIG. 3.3. FANGMATAN MAP, RECTO OF BOARD 3. (Reconstruction below.)
Size of the original: 18.1 × 26.5 cm. By permission of Wenwu Chubanshe. Reconstruction from Cao Wanru et al., eds., *Zhongguo gudai ditu ji* (Beijing: Wenwu Chubanshe, 1990–), vol. 1, fig. 5.

by labels. The names of settlements are enclosed in squares. There is some overlap between the maps in geographic coverage, and there are discrepancies in the location of certain features.[9] Like the *zhaoyu tu*, the wooden maps bear annotations giving distances, but they do not indicate the points these distances are meant to connect. No directions are marked on the maps. One map has a label indicating which side is the top, and this has been found to correspond with a northern orientation. The other maps, however, are oriented in different directions.

One other discovery from Fangmatan is worth mentioning. In another tomb dating from 179–141 B.C. (Former Han) a fragment of what some believe to be a map was found inside a coffin on the chest of the deceased. The fragment has been described as a piece of yellow paper (fig. 3.5). Black lines are used to depict mountains, rivers, and roads. The fragment is too small to permit a positive identification of the area depicted,

9. There are conflicting interpretations regarding the relationship among the map images. He Shuangquan thinks that six of the maps can be combined to form a composite image of the district. Cao Wanru has argued that one of the images, one that He places at the center of the composite image, is a general map of the district, while the others are detail maps of that area. See He, "Tianshui Fangmatan Qin mu chutu ditu chutan," 14, 16 (note 8); and Cao Wanru, "Youguan Tianshui Fangmatan Qin mu chutu ditu di jige wenti" (Several problems concerning the maps excavated from the Qin tomb at Fangmatan in Tianshui), *Wenwu*, 1989, no. 12:78–85, esp. 80, and idem, "Ancient Maps Unearthed from Qin Tomb of Fangmatan and Han Tomb of Mawangdui: A Comparative Research," *Journal of Chinese Geography* 3, no. 2 (1992): 39–50.

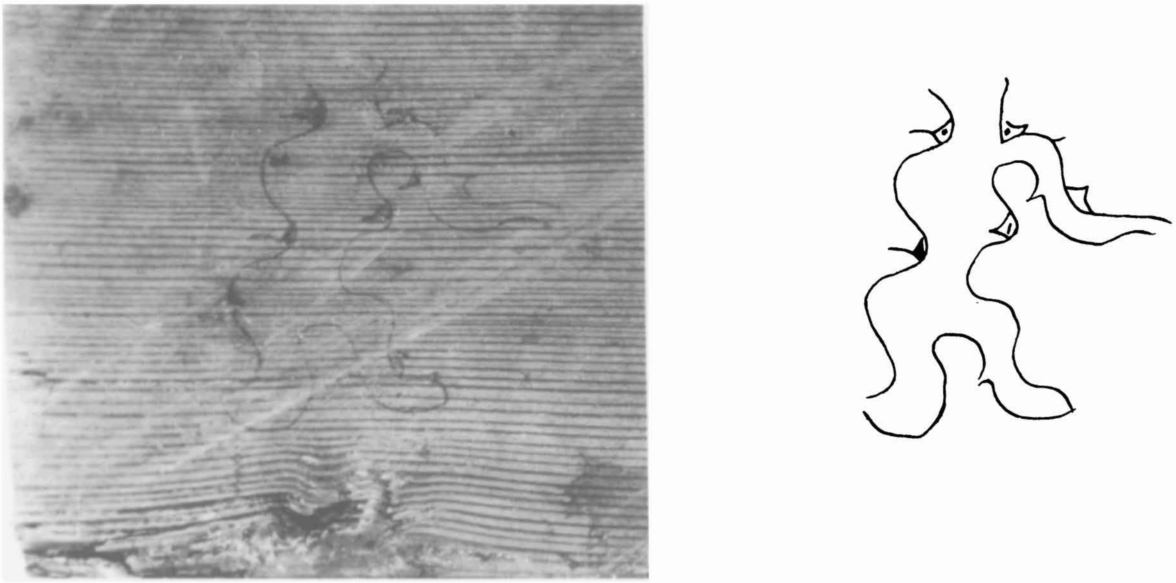


FIG. 3.4. FANGMATAN MAP, DETAIL OF THE VERSO OF BOARD 3. This detail is about one-fourth of the entire board (reconstruction on the right). Size of the entire original: 18.1 × 26.5 cm. By permission of Wenwu Chubanshe. Reconstruction from Cao Wanru et al., eds., *Zhongguo gudai ditu ji* (Beijing: Wenwu Chubanshe, 1990–), vol. 1, fig. 9.

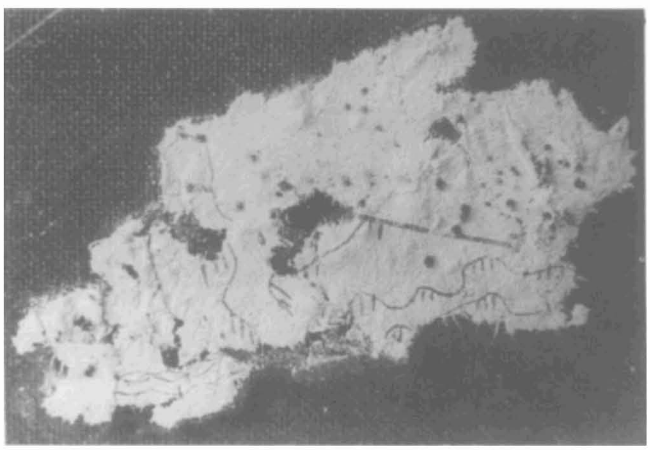


FIG. 3.5. MAP FRAGMENT ON PAPER. Discovered at Fangmatan, this fragment dates from between 179 and 141 B.C. Size of the original: 2.6 × 5.6 cm. By permission of Wenwu Chubanshe.

One of the three maps was in tatters when it was found; its condition has made interpretation difficult (fig. 3.6). The upper half of the map contains an irregular closed curve filled in with oblique lines, a yellow line, squares, and rectangles. What these features represent is unclear but it may well have been the Wei River valley region shown in the earlier Fangmatan maps.[10]

The Fangmatan map fragment is roughly contemporaneous with three silk maps found in 1973 in a tomb at Mawangdui on the outskirts of Changsha in Hunan Province. All three of these maps depict portions of the Changsha state, whose territory during the early Han included present-day Hunan and adjacent portions of Guangdong and Guangxi. The person buried in the tomb was evidently a high-ranking official in the state.[11] His burial took place in 168 B.C.; thus the maps must have been drawn somewhat earlier.

10. The interpretation of this artifact has been subject to debate. When it was produced and whether it is indeed a map have not been established conclusively. The description here is based on that given by Gansusheng Wenwu Kaogu Yanjiusuo and Tianshui Beidaoqu Wenhuaguan (Institute of Archaeology, Gansu Province, and Cultural Center of Beidao District of Tianshui), "Gansu Tianshui Fangmatan Zhanguo Qin Han muqun di fajue" (Excavation of the tombs from the Qin state of the Warring States period and from the Han dynasty), *Wenwu*, 1989, no. 2:1–11, esp. 9. Chen Qi-xin and Li Xing Guo have challenged the dating of this artifact and its identification as a map, arguing that it could have fallen into the coffin sometime after the coffin had decayed. They further maintain that the black lines on the paper could have been stains from the black paint on the coffin. See Chen Qi-xin and Li Xing Guo, "The Unearthed Paperlike Objects Are Not Paper Produced before Tsai-Lun's Invention," *Yearbook of Paper History* 8 (1990): 7–22. In the same journal Wang Ju Hua also challenges the dating of the paper artifact. He does not, however, question whether it is a map. See Wang Ju Hua, "The Inventor of Paper Technology—Ts'ai Lun," *Yearbook of Paper History* 8 (1990): 156–63. It is worth noting that the authors of the last two articles have not based their arguments on firsthand inspection of the artifact in question.

11. Tomb 3 at Mawangdui, in which the maps were found, is believed to be that of a son of Li Cang, marquis of Dai, chancellor to the prince of Changsha. Li Cang was buried in Mawangdui tomb 2 in 186 B.C. Tomb 1 was that of Li Cang's wife, who was buried not long after 168 B.C. Li's son may have served in the military as a general.

because of gaps in the map. The lower part of the map shows a city with an outer and inner wall (fig. 3.7).[12]

The other two maps found at Mawangdui are in better condition. They have been restored, and detailed accounts of them have been published.[13] Both are oriented with south at the top. One represents the southern part of the Changsha state and is referred to as a topographic map, because it emphasizes mountainous areas and the courses of rivers (figs. 3.8 and 3.9). The names of the mountains are not given, but rivers, as well as county seats, are identified. The map was drawn with vegetable colors. The third map (figs. 3.10 and 3.11) is thought to represent a portion of the terrain shown on the topographic map—more specifically, part of the southernmost portion. This area was of military significance since it bordered on Nanyue, a reluctant tributary state to the Han. Because it shows the locations of army installations and headquarters, the third map is thought to have had military applications. It is notable for its use of color: military-related features, roads, and some settlements are shown in red; rivers and streams in light blue-green; and other features and lettering in black. The map also bears annotation. For some settlements, distances from other settlements and the number of households are given.

All the maps described so far have been valued for their "modern" appearance. Their mode of presentation seems to be planimetric, and the manner of depiction tends toward conventionalization, for instance, in the representation of settlements, mountains, and trees. In

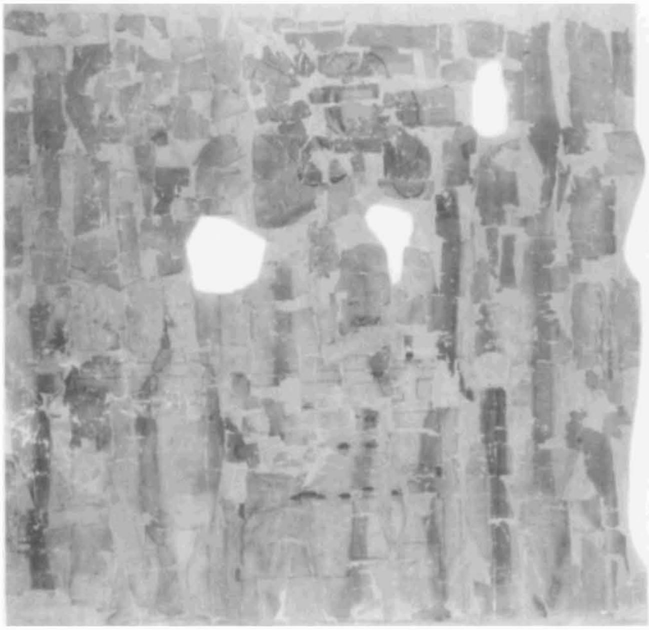


FIG. 3.6. HAN SILK MAP UNEARTHED AT MAWANGDUI. This map was unearthed in 1973 from tomb 3 at Mawangdui. It was drawn on the same piece of silk as an illustration showing breathing exercises and calisthenics. The tattered condition of the map has made interpretation difficult. The lower half of the map seems to represent a walled city (see fig. 3.7).
Size of the original: 48 × 48 cm. Photograph courtesy of Cao Wanru, Institute for the History of Natural Sciences, Academia Sinica, Beijing.

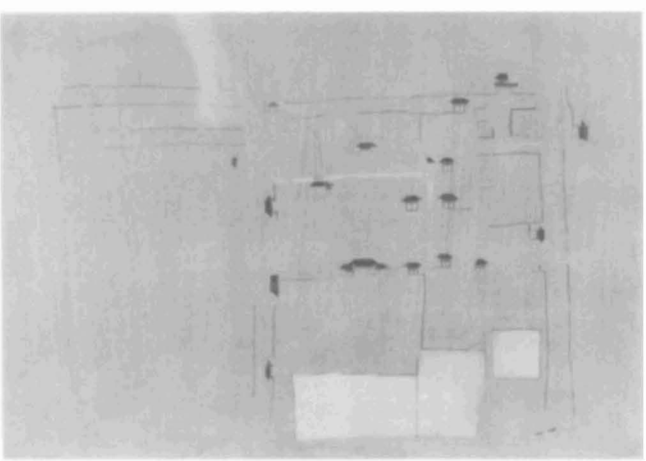


FIG. 3.7. DETAIL OF THE HAN SILK MAP. A copy of the lower center portion of the map in figure 3.6. The outer wall of the city, as drawn on the map, measures 18.8 by 20 centimeters.
Photograph courtesy of Cao Wanru, Institute for the History of Natural Sciences, Academia Sinica, Beijing.

12. Information on this map is taken from Han Zhongmin's description in Cao Wanru et al., eds., *Zhongguo gudai ditu ji* (Atlas of ancient Chinese maps) (Beijing: Wenwu Chubanshe, 1990–), 1:18. Han conjectures that the map as a whole represents the mausoleum and the city of the marquis of Dai, Li Cang. Cao Wanru, however, believes that the map depicts cities and towns of the southern Changsha state; see Cao Wanru, "Maps 2,000 Years Ago and Ancient Cartographical Rules," in *Ancient China's Technology and Science*, comp. Institute of the History of Natural Sciences, Chinese Academy of Sciences (Beijing: Foreign Languages Press, 1983), 250–57, esp. 251.

13. Information on the Han silk maps is drawn largely from the following studies: Mawangdui Han Mu Boshu Zhengli Xiaozu (Study Group on the Han Silk Manuscripts from Mawangdui), "Changsha Mawangdui sanhao Han mu chutu ditu di zhengli" (Restoration of the maps excavated from Han tomb 3 at Mawangdui, Changsha), *Wenwu*, 1975, no. 2:35–42; idem, "Mawangdui sanhao Han mu chutu zhujun tu zhengli jianbao" (Preliminary report on the restoration of the military map excavated from Han tomb 3 at Mawangdui), *Wenwu*, 1976, no. 1:18–23; Tan Qixiang, "Erqian yibaiduo nian qian di yifu ditu" (A map from more than 2,100 years ago), *Wenwu*, 1975, no. 2:43–48; and Zhan Libo, "Mawangdui Han mu chutu di shoubei tu tantao" (Investigation of the garrison map excavated from the Han tomb at Mawangdui), *Wenwu*, 1976, no. 1:24–27. English-language treatments of these maps have been written by A. Gutkind Bulling, "Ancient Chinese Maps: Two Maps Discovered in a Han Dynasty Tomb from the Second Century B.C.," *Expedition* 20, no. 2 (1978): 16–25; Mei-ling Hsu, "The Han Maps and Early Chinese Cartography," *Annals of the Association of American Geographers* 68 (1978): 45–60; and Kuei-sheng Chang, "The Han Maps: New Light on Cartography in Classical China," *Imago Mundi* 31 (1979): 9–17.

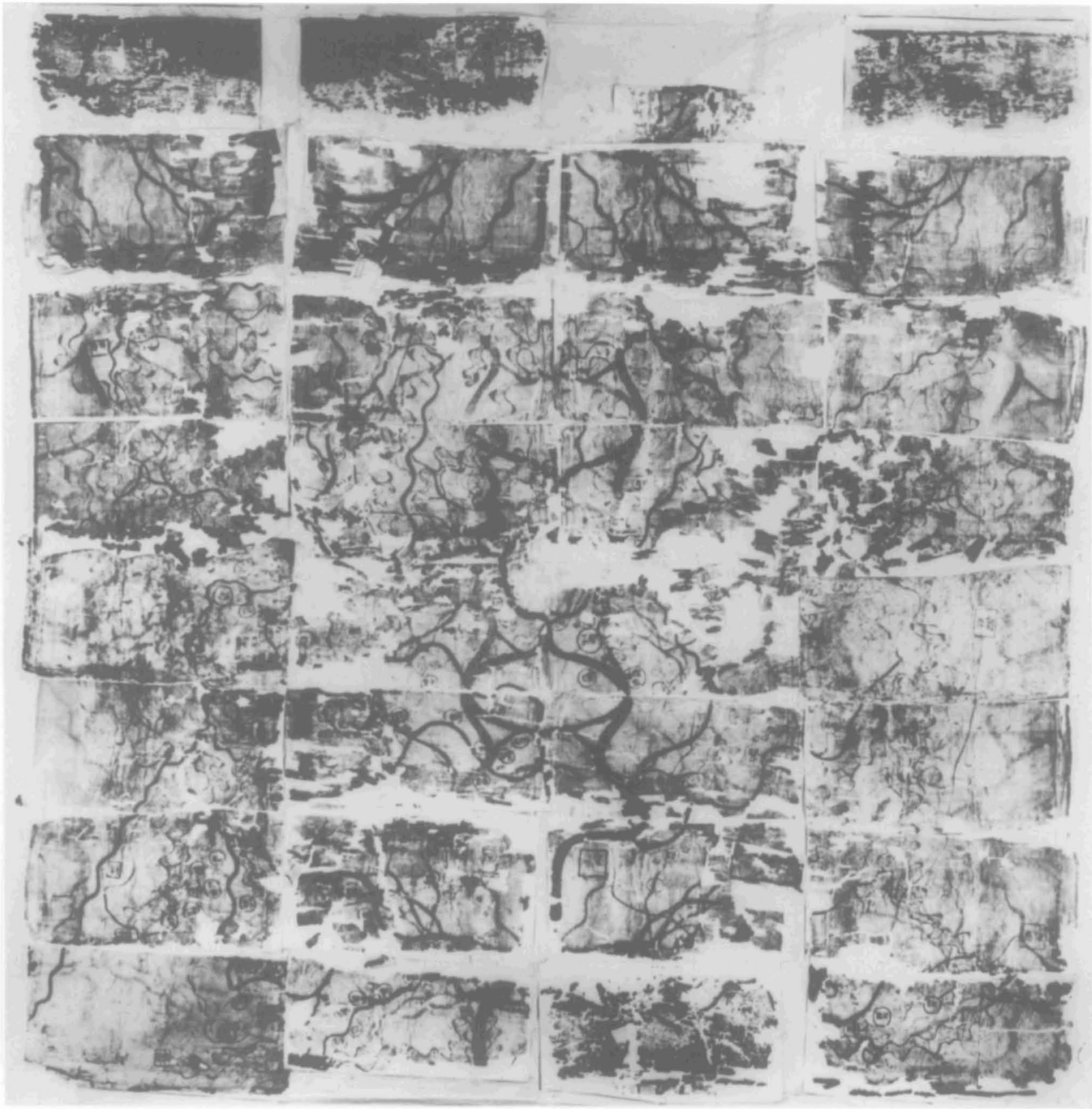


FIG. 3.8. TOPOGRAPHIC MAP FROM MAWANGDUI. Both this map and those shown in figures 3.6 and 3.10 date from the Han dynasty and were found in a lacquer box. They had been folded up, and by the time they were unearthed they had disintegrated around the folds. The folded sections had also become stuck together, making restoration difficult. This topographic map consists of thirty-two pieces. Following the orientation of the graphs, south is at the top.
Size of the original: 96 × 96 cm. By permission of Wenwu Chubanshe.

addition, the artifacts have been interpreted as examples of scale mapping. There is some textual support for this. An astronomico-mathematical work, the *Zhoubi suan jing* (Arithmetical classic of the Zhou gnomon, ca. 200 B.C.), describes the effect of altering scale on the size of a map: "Whenever a scale of one *fen* to a thousand *li* was used, one drew a square map of eight *chi* and one *cun*. In present usage, one draws a square map of [half the size, or] four *chi* and five *fen*. A *fen* [in this case] is equal to two thousand *li*."[14] Modern scholars have

14. *Zhoubi suan jing*, *Siku quanshu* edition, A3.2a.

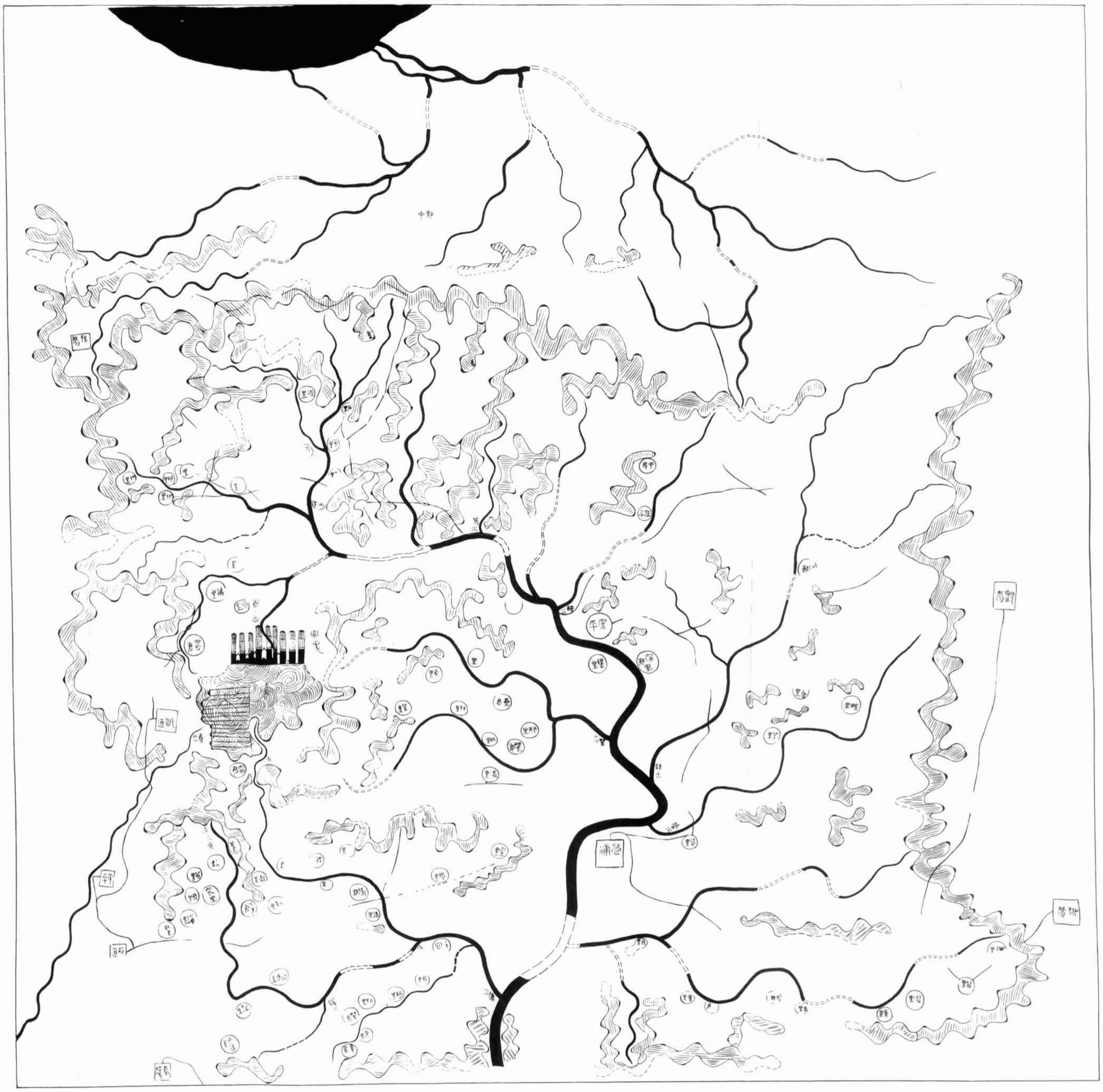


FIG. 3.9. RECONSTRUCTED TOPOGRAPHIC MAP FROM MAWANGDUI. The map is thought to represent an area mainly lying between 110° and 112°30′E and between 23° and 26°N.

From *Gu ditu lunwenji* (Essays on ancient maps) (Beijing: Wenwu Chubanshe, 1977).

tended to interpret the pre-Han and Han artifacts in light of such references to scale and have taken pains to establish scale mapping as a general practice during the Han and even earlier. From dimensions marked on the early artifacts and from comparisons of the early maps with modern maps, researchers in China have calculated the scales of the early map images. It has been determined that the scale for the area within the baseline of the *zhaoyu tu* is about 1:500; outside it, this scale is not maintained. The scale of the Fangmatan maps has been determined to be about 1:300,000. As for the Mawangdui maps, the scale has been found to vary between 1:150,000 and 1:200,000 in the central portion of the topographic map and between 1:80,000 and 1:100,000 in the central

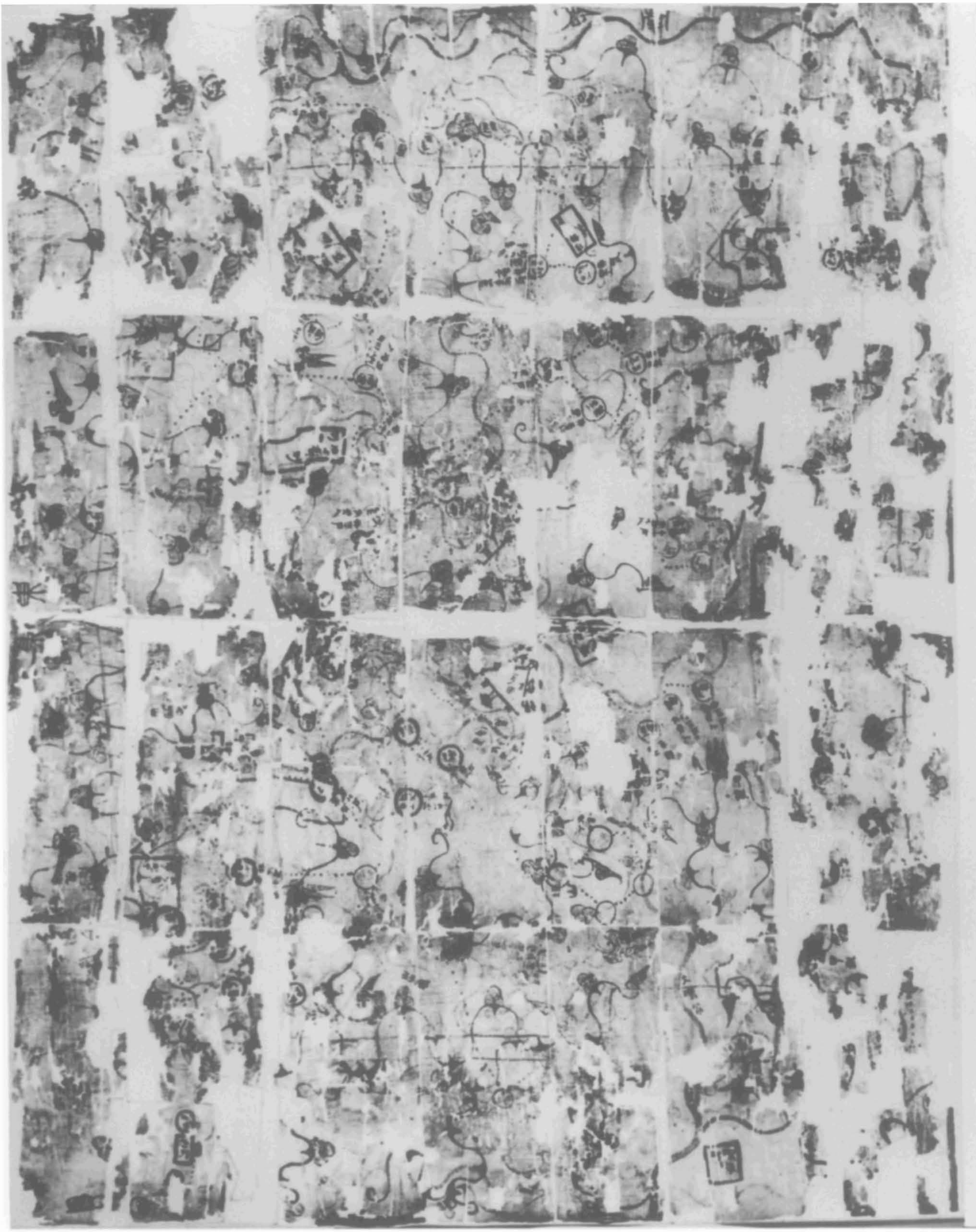


FIG. 3.10. GARRISON MAP FROM MAWANGDUI. This map consists of twenty-eight pieces. South is at the top and labeled. Size of the original: 98 × 78 cm. By permission of Wenwu Chubanshe.

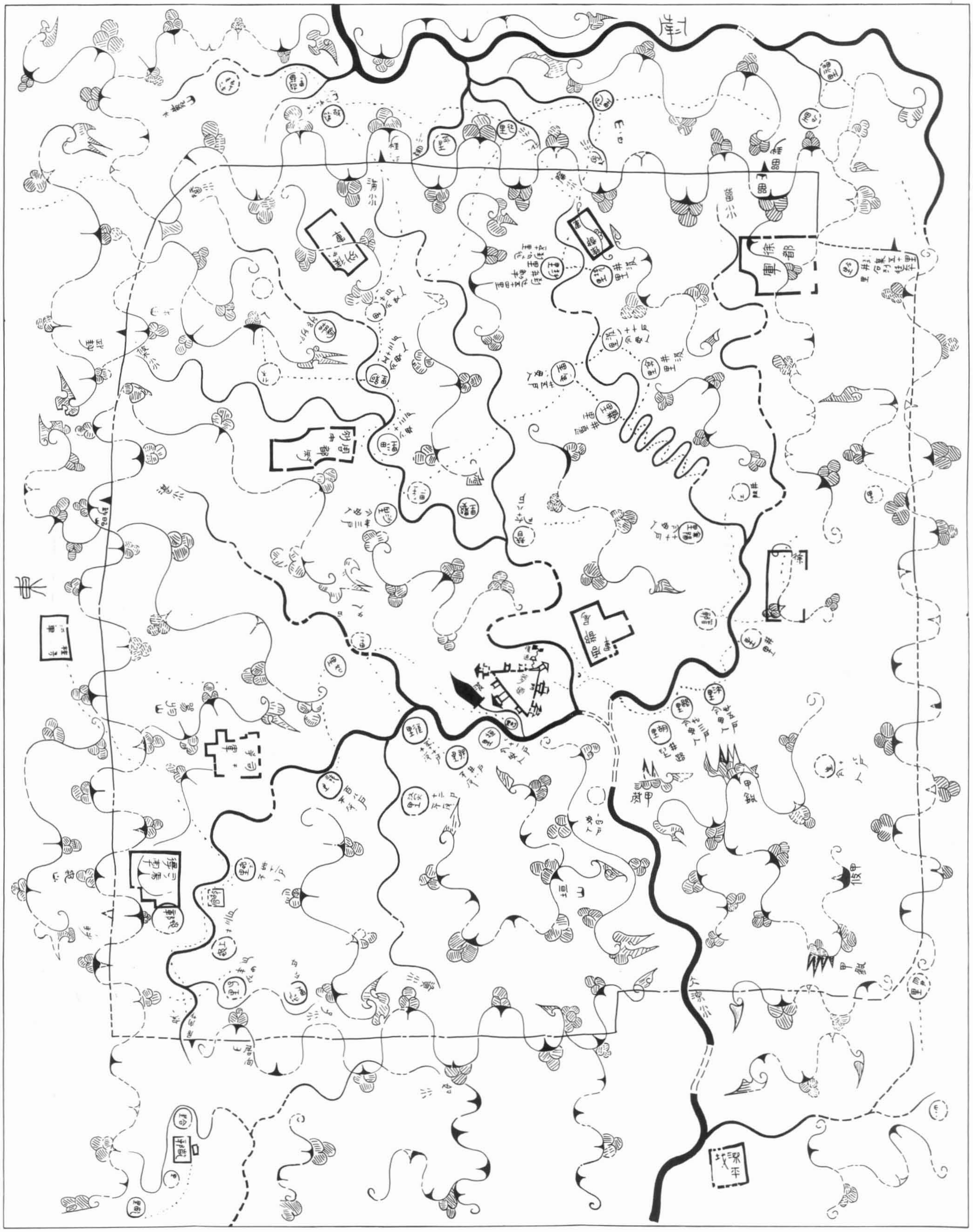


FIG. 3.11. RECONSTRUCTED GARRISON MAP FROM MAWANGDUI.

From *Gu ditu lunwenji* (Essays on ancient maps) (Beijing: Wenwu Chubanshe, 1977).

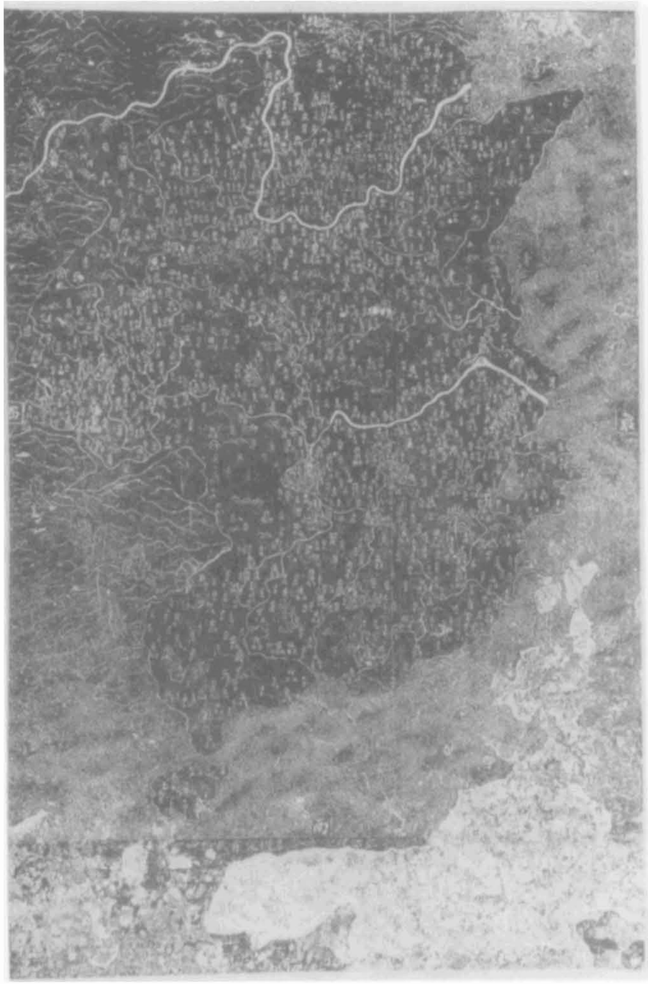


FIG. 3.12. *JIU YU SHOULING TU*. Engraved on stone in 1121. Size of the original: 130 × 100 cm. Photograph courtesy of Cao Wanru, Institute for the History of Natural Sciences, Academia Sinica, Beijing.

portion of the military map. This is a "remarkably small" scale error, in the words of one researcher.[15]

The next group of artifacts dates from about twelve centuries later than those found at Mawangdui—from the Song dynasty. The early artifacts described above were in the main local maps. Although textual sources contemporaneous with and later than those artifacts attest to maps of the empire, no such artifacts survive from the Tang or before. The earliest examples are from the Song, and these suggest that mapping had progressed to the point that imperial maps of "high" quality could be produced.[16] The task of compiling maps of the entire empire must have been time consuming, if the first surviving artifacts are any indication. They are engraved in stone, the medium of commemoration, suggesting that the makers thought the maps were important enough to merit long-term preservation in the manner of classic texts, which were often engraved in stone as well. The stone maps were set up in schoolyards, studied by students, and frequently copied.

The earliest extant example of such a comprehensive map is the *Jiu yu shouling tu* (Map of the prefectures and counties of the nine districts [the empire]). It was engraved on stone in 1121 in Rongzhou (in present-day Sichuan Province) and erected in the courtyard of the prefectural school there. After being lost for several centuries, the map was rediscovered by archaeologists in 1964.

The *Jiu yu shouling tu* names more than 1,400 administrative units (fig. 3.12). Its scale is said to be 1:1,900,000.[17] Coastal features such as the Shandong peninsula, Hangzhou Bay, the Leizhou peninsula, and Hainan Island are clearly recognizable. Seas and lakes are depicted using waves on which are scattered sailing vessels. Mountains are drawn pictorially, and tree symbols indicate that slopes are forested. The course of the Huanghe, or Yellow River, however, was outdated at the time the map was engraved. In 1121 the river ran northward before emptying into the ocean near Tianjin. The *Jiu yu shouling tu* shows the river flowing eastward, emptying near the present-day border of Hebei and Shandong provinces, which suggests that it was based on an earlier map made when the Yellow River actually followed the eastward course. This direction of flow occurred twice: from 1069 to 1081 and from 1094 to 1099.[18]

Another map of the empire, the *Hua yi tu* (Map of Chinese and foreign lands), was engraved on stone in 1136 (fig. 3.13), but information on the map suggests that the image was perhaps compiled during 1117–25. The *Hua yi tu* provides about five hundred place-names and identifies about thirteen rivers and tributaries, four lakes, and ten mountain ranges. Information on foreign lands is provided in notes. The map lacks an expressed scale, and its image is regarded as deficient in certain respects: it locates the sources of the Changjiang (Yangtze River) and Yellow River in the wrong places, and its depiction of the coastline does not adequately represent the Liaodong and Shandong peninsulas.

Such deficiencies do not appear on a map carved on the opposite side of the same stele as the *Hua yi tu*. This

15. Hsu, "Han Maps," 49 (note 13).

16. The Tang mapmaker Jia Dan (730–805) is credited with producing imperial maps of high quality, but none of his maps survive. The *Hua yi tu* (Map of Chinese and foreign lands), engraved on stone in 1136 and described below, may have been based on a map by Jia Dan, but how closely the stone map conforms to its possible ancestor is impossible to determine.

17. Chen Feiya et al., eds., *Zhongguo gudai dilixue shi* (History of ancient Chinese geography) (Beijing: Kexue Chubanshe, 1984), 306.

18. Zheng Xihuang, "*Jiu yu shouling tu* yanjiu" (A study of the *Jiu yu shouling tu*), in *Zhongguo gudai ditu ji*, ed. Cao Wanru et al. (Beijing: Wenwu Chubanshe, 1990–), 1:35–40, esp. 35.

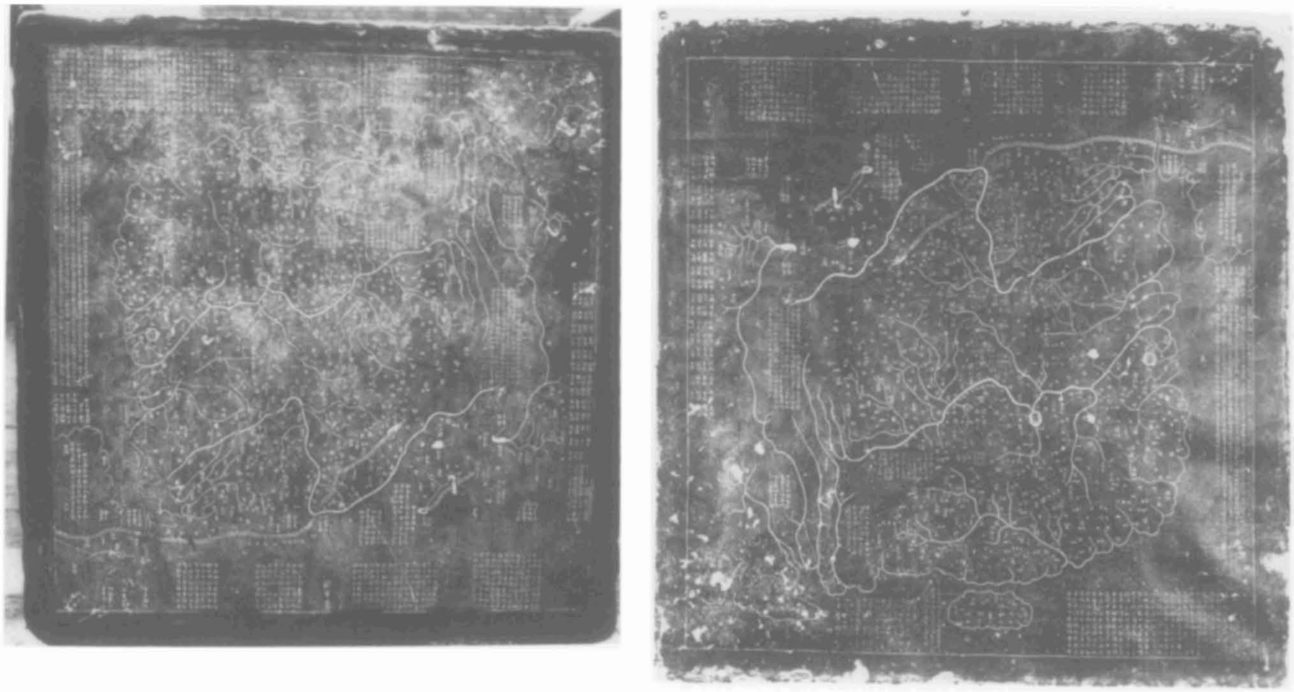


FIG. 3.13. *HUA YI TU.* Engraved on stone in 1136, it may have been based on a map by the Tang scholar Jia Dan. On the left is the stele and on the right is a rubbing of the map. On the other side of this stele is the 1136 *Yu ji tu* (Map of the tracks of Yu), figure 3.14, but it is oriented in the opposite direction so that when one map is right side up (in this case, fig. 3.14), the other is inverted. Thus it would have been difficult to display both of these maps on the stele at the same time. The stele may have been intended not for display but as a means of reproduction. The image could be transferred by "rubbing"—placing a sheet of paper over the engraved surface and applying ink to the paper so as to produce a white-on-black reproduction. An inscription on the lower right side of the map (when the map is right side up) says: "The venerable Jia Wei [Jia Dan] of the Tang dynasty listed several hundred countries. Now we [or I] have selected the well-known ones and recorded them here."
Size of the original: 79 × 79 cm. Photographs courtesy of Cao Wanru, Institute for the History of Natural Sciences, Academia Sinica, Beijing.

is the *Yu ji tu* (Map of the tracks of Yu), also engraved in 1136 (fig. 3.14). Internal evidence suggests that the map image was originally drawn somewhat earlier: for example, there are no names of prefectures and counties established after 1100. Until the discovery of the Mawangdui maps, the *Yu ji tu*, measuring about eighty centimeters square, was one of the most celebrated examples of the precocious development of Chinese cartography. The reasons are not hard to fathom. The map's representation of China's coastline is remarkably close to twentieth-century representations, and the map marks the first known appearance of the Chinese cartographic grid, consisting of a latticework of squares of equal size superimposed on a map image. The squares serve to indicate scale: each grid increment, or side of a square, represents a fixed ground distance. A note engraved on the *Yu ji tu* states that each side of a square represents one hundred *li*, and on that basis the map scale is assumed to be about 1:4,500,000.[19]

A second version of the *Yu ji tu*, at Zhenjiang, Jiangsu (fig. 3.15),[20] was carved in stone in 1142, commissioned by the director of the local prefectural school. It is similar to the 1136 version in many ways: in its use of the square grid and an expressed scale of one side of a square to one hundred *li*, in the dimensions of the image, in its depiction of mountains and rivers, and in the names of the prefectures and counties. There are some differences, however. The 1142 map image does not distinguish between main streams and tributaries. An inscription on the 1142 version corroborates the suggested date of 1100 for the original compilation: "Carved in the first month of the third year of the Yuanfu reign period [1100] according to the model copy at Chang'an."

It might seem that in comparing the *Jiu yu shouling tu* and *Hua yi tu* with the *Yu ji tu*, one sees in the last increasing technical competence in the production of map images. One sign is the use of the grid as a scaling device, suggesting the importance of scale imaging to

19. Cao et al., *Zhongguo gudai ditu ji*, 21 (note 12).

20. There are reports of a third stone *Yu ji tu*, now lost, that was once kept at Jishan Xian, Shanxi. The map is said to have had a square grid with a scale of "one [side of a] square to one hundred *li*." See Lu Liangzhi, *Zhongguo dituxue shi* (History of Chinese cartography) (Beijing: Cehui Chubanshe, 1984), 156.

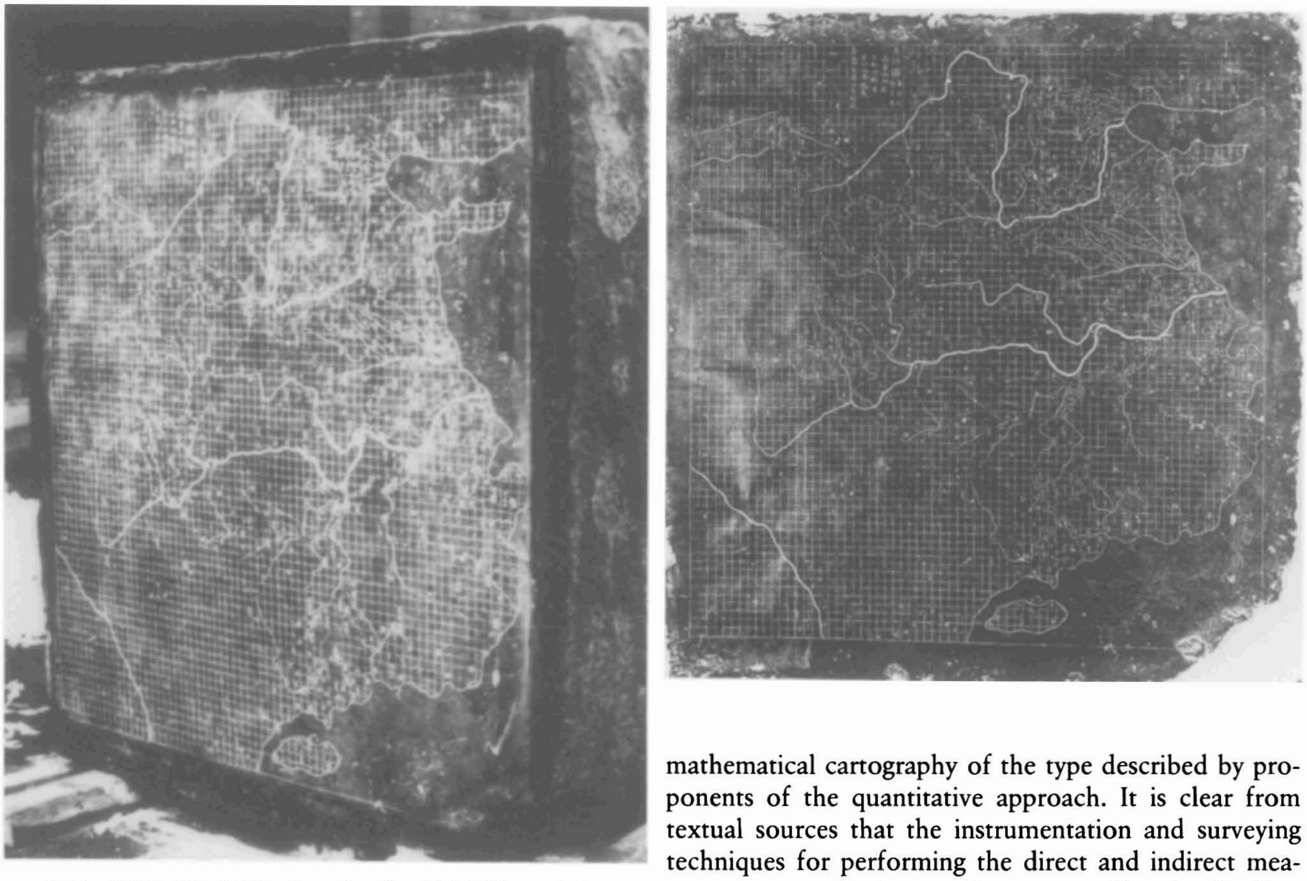


FIG. 3.14. *YU JI TU*, 1136. (See also fig. 3.13.) The stele is on the left and a rubbing is on the right.
Size of the original: 80 × 79 cm. Photographs courtesy of Cao Wanru, Institute for the History of Natural Sciences, Academia Sinica, Beijing.

Chinese mapmakers. The grid certainly contributes to the "modern look" of the *Yu ji tu*, because it resembles the graticule used on modern maps. As a consequence, the *Yu ji tu* is often described as indicating the advanced level of mathematical cartography in traditional China: "Anyone who compares this map with the contemporary productions of European religious cosmography . . . cannot but be amazed at the extent to which Chinese geography was at that time ahead of the West."[21]

The accuracy of the *Yu ji tu*, especially in its representation of the rivers and coastline, is remarkable, and even more so given that so little else like it from earlier times has survived. Precisely how its maker achieved such accuracy is unknown. At most one can speculate that the *Yu ji tu* was based on information from gazetteers and other geographical writings, and from earlier imperial and regional maps that, though no longer extant, are often mentioned in textual sources. In addition, there is no disputing that by the time the *Yu ji tu* was produced, the Chinese had already established the foundations for a mathematical cartography of the type described by proponents of the quantitative approach. It is clear from textual sources that the instrumentation and surveying techniques for performing the direct and indirect measurements required to produce a map like the *Yu ji tu* had been developed well before the twelfth century (see pp. 115–16).

For proponents of the quantitative approach, the artifacts described so far provide a context for certain surviving texts on mapmaking, some written by mapmakers, others by imperial historians. In line with quantitative interpretations of the artifacts, these texts are interpreted as advocating scale mapping and the employment of mathematical techniques, as will be outlined here. One of the seminal texts on cartography is a statement of mapmaking principles by Pei Xiu (223–71). That statement stresses the importance of measurement and scale for achieving fidelity to geographic actualities (see pp. 110–13). Some, including Joseph Needham, have interpreted Pei's statement as advocating the use of the cartographic grid, but there is no evidence for this. Before the discovery of the pre-Han and Han maps, Pei Xiu was thought to have initiated a mathematical tradition. If current interpretations of the *zhaoyu tu* and the Fangmatan and Mawangdui maps are accepted, however, Pei's principles of measurement were understood well before his time, so that his statement represents a culmination of

21. 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), 547.

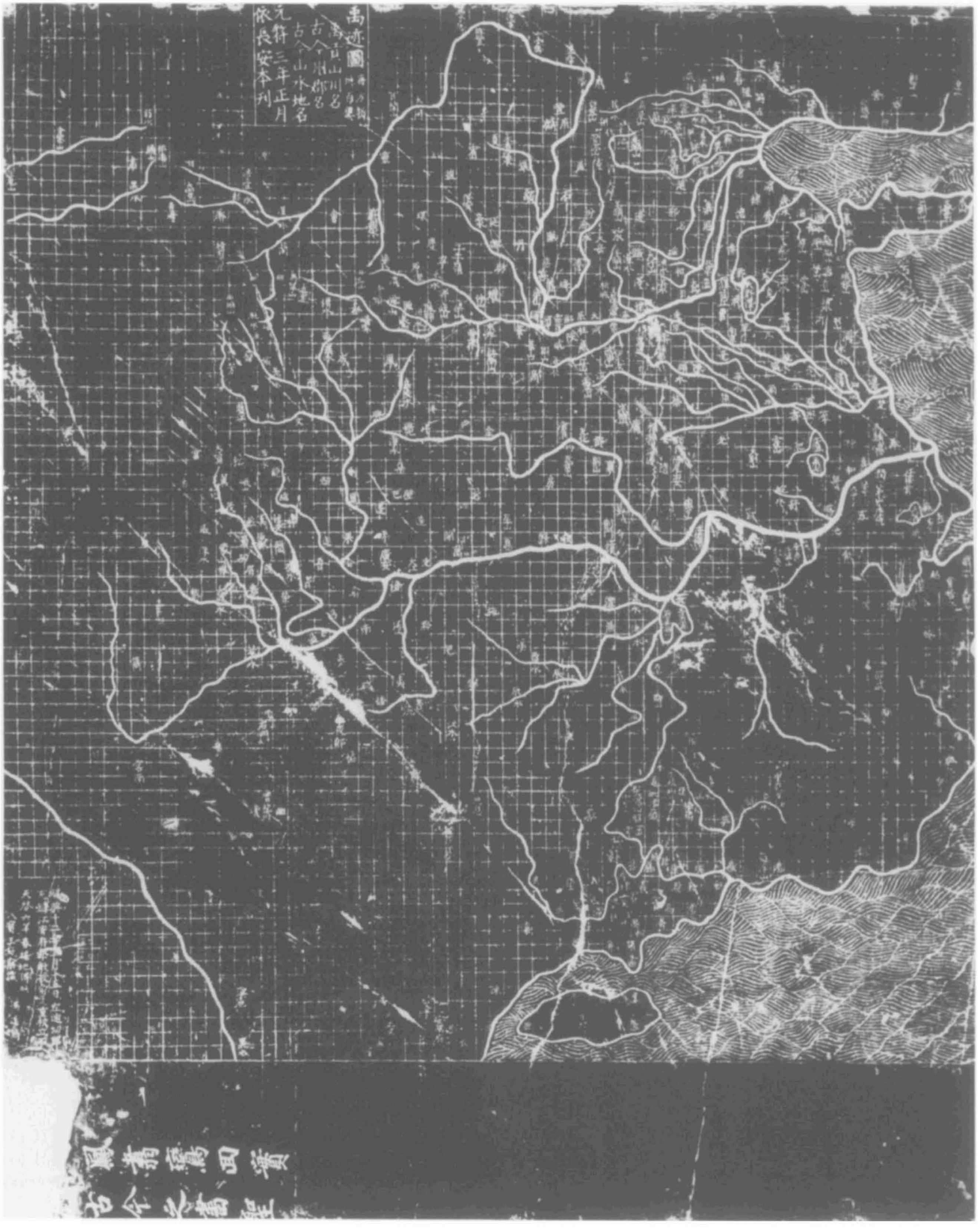


FIG. 3.15. RUBBING OF THE *YU JI TU*, 1142.
Size of the original: 83 × 79 cm. Photograph courtesy of Cao Wanru, Institute for the History of Natural Sciences, Academia Sinica, Beijing.

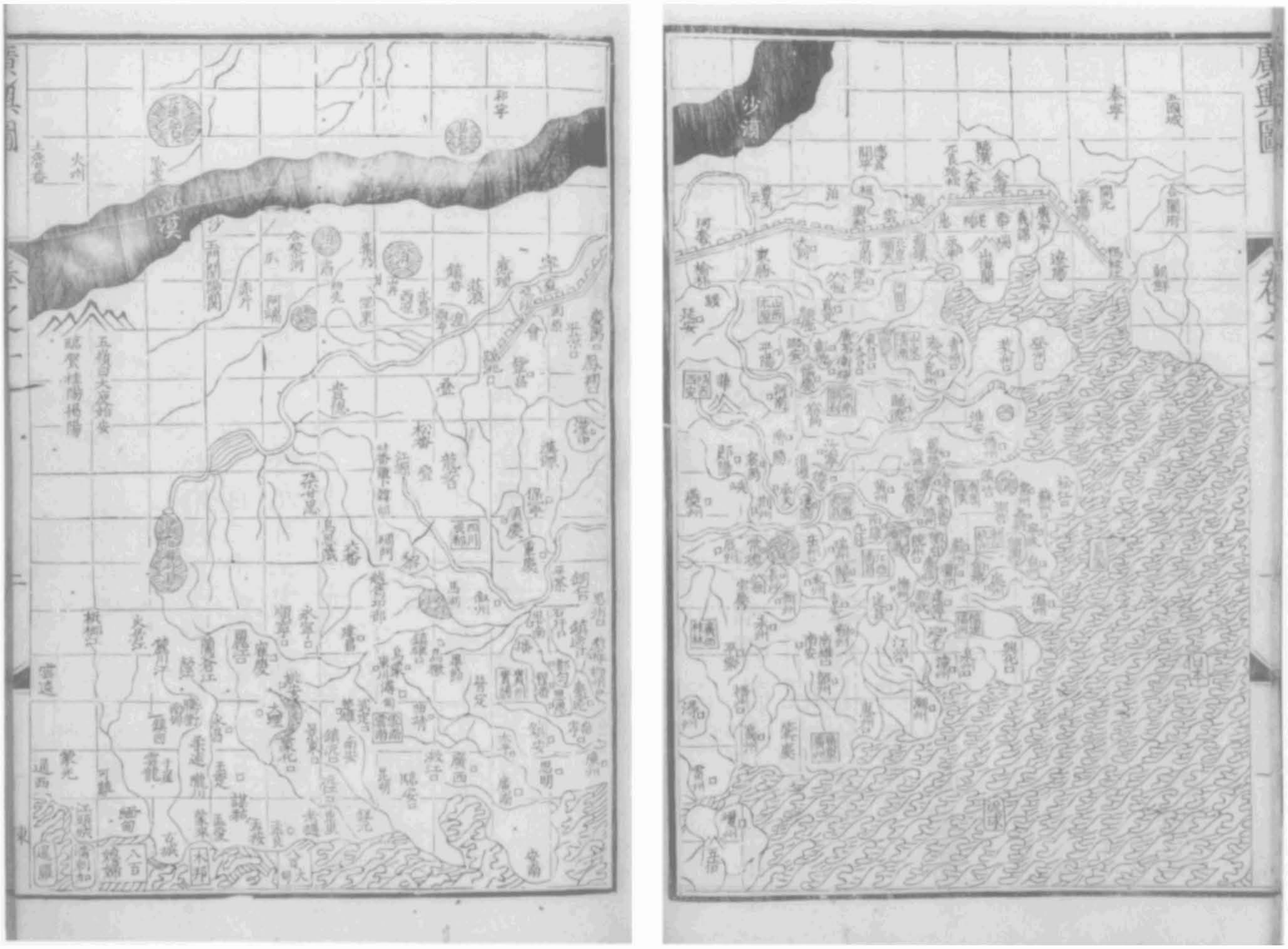


FIG. 3.16. MAP FROM THE *GUANG YUTU*. According to the accompanying text, this general map of the empire is drawn so that "each [side of a] square [represents] one hundred *li*." All the maps in the *Guang yutu* have grids, most with each side of a square representing one hundred *li*. Among the other maps included in the *Guang yutu* are provincial maps, coastal maps, hydrological maps, and maps of Korea, Vietnam, and Japan. This illustration is taken from the *Guang yutu* dated 1799, which is an exact copy of the 1579 edition.
Size of the original: 28.5 × 41 cm. By permission of the British Library, London (15261.e.2), 1b–2a.

tradition, not an innovation. To judge from the present artifactual record, that tradition did not include a cartographic grid.

The next important figure for the exponents of the mathematical interpretation is Jia Dan (730–805), who cites Pei Xiu's attention to measurement as a model. In one historical account, Jia Dan is described as having ordered a scale map to be made: "He ordered an artisan to paint the *Hainei Hua yi tu* [Map of Chinese and foreign lands within the seas] on a scroll. It was three *zhang* wide and three *zhang* and three *chi* high. Its scale was one *cun* to one hundred *li*."[22] Since he was familiar with Pei's principles and admired them, Jia Dan has been regarded by some as a user of the square grid. Shen Kuo (1031–95) can be added to the list of mathematical cartographers. He uses terminology similar to Pei Xiu's in a list of his own mapmaking methods. In addition, at least one scholar suspects that Shen Kuo was responsible for the *Yu ji tu*, thereby linking Shen more closely to a "grid" tradition.[23]

That tradition is said to extend to the sixteenth century with the work of Luo Hongxian (1504–64): grids appear on the maps in his *Guang yutu* (Enlarged terrestrial atlas,

22. Liu Xu et al., *Jiu Tang shu* (Old history of the Tang, compiled 940–45), chap. 138; see the edition in 16 vols. (Beijing: Zhonghua Shuju, 1975), 12:3786.

23. Cao Wanru, "Lun Shen Kuo zai dituxue fangmian di gongxian" (On Shen Kuo's contributions to cartography), *Keji Shi Wenji* 3 (1980): 81–84. Cao's argument is based on Shen Kuo's presence near Chang'an (present-day Xi'an) in the years 1080–82, a period coinciding roughly with the time when the information reflected on the *Yu ji tu* was compiled. She reasons that since Shen Kuo compiled a map of the empire and had high standards of mapmaking that are reflected on the stone map, he could have been the author of the original image.

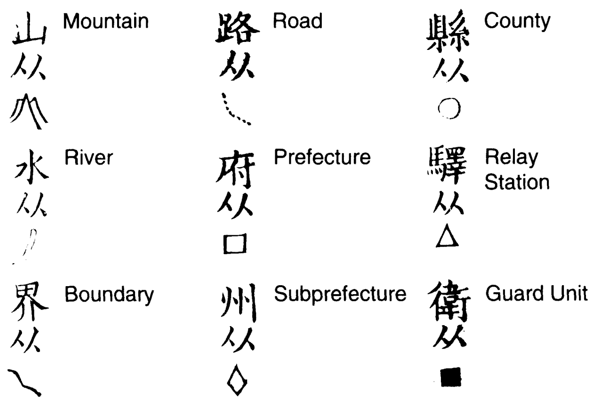


FIG. 3.17. SIGNS FROM THE LEGEND ON THE *GUANG YUTU*. In the preface to the *Guang yutu*, Luo Hongxian lists signs for mountains, rivers, boundaries, roads, prefectures, subprefectures, counties, cities, postal relay stations, and military units of varying size.
Compiled from Luo Hongxian, *Guang yutu*, 6th ed. (1579; reprinted Taipei: Xuehai Chubanshe, 1969), preface, 3a–b.

ca. 1555) (fig. 3.16). Luo's work was based on the *Yutu* (Terrestrial map, 1320) by the Yuan mapmaker Zhu Siben (1273–1337), and in the preface to his atlas Luo says that Zhu used grids on his map. Furthermore, Zhu's own preface, preserved in Luo's work, says that among the maps he consulted was a *Yu ji tu* engraved on stone in present-day Hubei.[24] If this map had a grid, it seems that Luo and Zhu were consciously following a tradition of grid mapping.

Luo's atlas has also drawn attention because it is the earliest known use of a map legend on a Chinese map (fig. 3.17). In his preface, Luo writes: "The names and forms of mountains and streams, and cities and towns cross each other so that they cannot all be written down. Instead, to save words twenty-four [signs] are used to avoid confusion and supplement [the main map image]."[25] Luo's list is not comprehensive, however, since it does not include the signs he used for the Great Wall, deserts, or lakes.

Luo's atlas was once valued for its use of abstract signs. It was taken as an indication that mapmakers were moving away from pictorialism. Wang Yong wrote that before Luo Hongxian, "drawing was often the work of painters. Maps were comparatively pictorialized: [the depiction of] things such as mountains and streams, cities and passes often approached the manner of realistic painting. Simple signs were not greatly used. In contrast, Luo Hongxian commonly and consistently used signs."[26] Above I said that the *Guang yutu* had been valued for its use of signs. It is still valued, but its use of signs appears less than unique in light of the Mawangdui maps.

The Mawangdui maps are adduced as evidence that mapmaking had already broken away from pictorialism. They have no legends, but they are regarded as sophisticated in their use of signs. On the "topographic" map, for example, signs have been identified for streams, mountains, prefectures, subprefectures, and roads.[27] The symbols for the rivers have often been remarked as widening as one moves downstream, which is taken as an indication that the mapmaker was trying to represent an increase in the volume of water. Some have stated that the representational methods used on this map, particularly those for rivers and mountains, are equal to those on maps from the Qing and even the twentieth century: this seems to include the *Yu ji tu* and *Guang yutu*.[28] The representation of Jiuyi Shan (Nine Beguiling Mountains) has received much attention (figs. 3.18 and 3.19). It consists of nine bars of varying length, with three grades of shading within them. The bars have been taken to represent the heights of the nine peaks, in which case the topographic map is also regarded as being in part a contour map. Kuei-sheng Chang, however, goes further, saying that the shading of the bars is "undoubtedly intended to convey other basic geographic information, possibly rainfall, temperature and/or cloudiness."[29] Under this interpretation, then, the "topographic" map becomes in part an early climatic map. The garrison map, it has been claimed, shows similar sophistication in the use of signs, particularly in representing mountains with wavy lines. One researcher believes that it expresses "the primitive but basic notion of contouring, the outline of the symbol being a *contour* which describes both the shape and size of the 'mountain' as the cartographer visualized it."[30]

If the proponents of a quantitative tradition of Chinese are correct, scale mapping has had a history of roughly seventeen centuries based on textual sources, or if pre-Han and Han artifacts are accepted as evidence, of about twenty-two centuries. This interpretation of traditional Chinese mapping practice is apparently buttressed by contextual considerations. As Needham and researchers writing in his wake have been fond of pointing out, the mathematical and mensurational foundation for a math-

24. See Zhu Siben's original preface to the *Yutu*, in Luo Hongxian, *Guang yutu*, 6th ed. (1579; reprinted Taipei: Xuehai Chubanshe, 1969), 1a–b, esp. 1a.

25. Luo, *Guang yutu*, preface, 3a (note 24).

26. Wang Yong, *Zhongguo ditu shi gang* (Brief history of Chinese cartography) (Beijing: Sanlian Shudian, 1958), 68–69.

27. Hsu, "Han Maps," 51 (note 13).

28. Tan, "Erqian yibaiduo nian qian di yifu ditu," 44–45, 47–48; Chang, "Han Maps: New Light," 14 (note 13).

29. Chang, "Han Maps: New Light," 10 (note 13). There is, however, no independent evidence for this interpretation, and Chang offers no support for it.

30. Hsu, "Han Maps," 55 (note 13).

FIG. 3.18. SIGN FOR JIUYI SHAN (NINE BEGUILING MOUNTAINS). Shown in the photograph is the sign for Jiuyi Shan that appears on the topographic map found at Mawangdui (fig. 3.8). A number of utilitarian functions have been proposed for its shape and shading. What seems to be a shadow image of part of the sign appears in the representation of an adjacent lake. This suggests that the sign may have had aesthetic value: the mapmaker may have been trying to show the reflection of the mountains in the lake.
Size of the detail: ca. 24 × 15 cm. By permission of Wenwu Chubanshe.

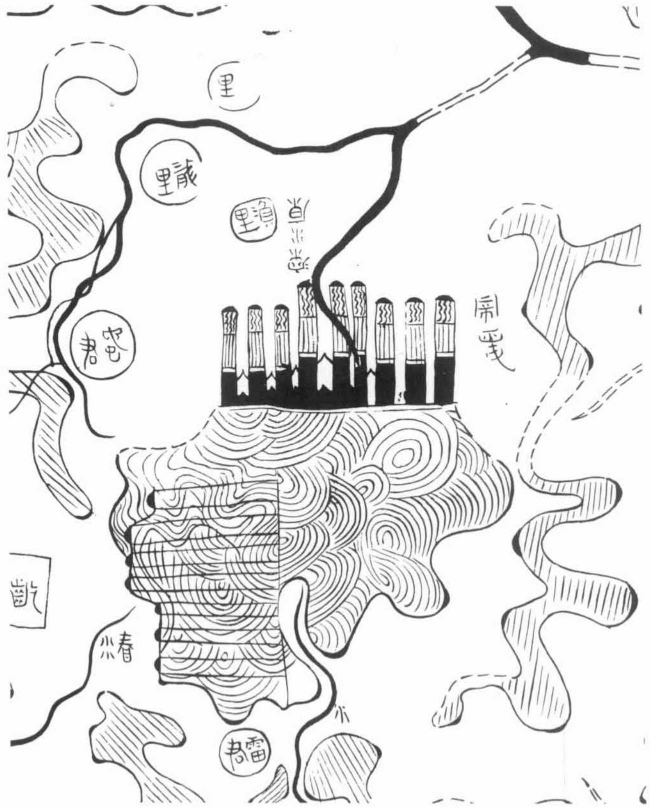


FIG. 3.19. RECONSTRUCTION OF THE SIGN FOR JIUYI SHAN. The shadow image shows up more clearly here (compare fig. 3.18).
From *Gu ditu lunwenji* (Essays on ancient maps) (Beijing: Wenwu Chubanshe, 1977).

ematical cartography was laid even before Pei Xiu. Such a foundation existed at least by the Han, if the Mawangdui maps are admitted as evidence: "The detail and accuracy of these maps could not have been achieved without substantial field surveying using relatively sophisticated techniques."[31] Such mensurational techniques were developed not only for cartography but also for related endeavors such as navigation and astronomy, and the evidence for these techniques often comes from those other fields.

The greatest achievement in navigation is associated with Zheng He (1371–1433), who from 1405 to 1433 led seven maritime expeditions as far west as the coast of eastern Africa and perhaps as far south as Kerguelen Island in the Indian Ocean. A navigational chart contemporaneous with Zheng He's voyages has been preserved in the *Wubei zhi* (Treatise on military preparations), compiled about 1621 by Mao Yuanyi (1594–ca. 1641). Mao provides no information on the source or maker of the chart, but some have traced it to Zheng He's voyages.[32]

31. Hsu, "Han Maps," 55 (note 13). See also Yang Wenheng, "Shilun Changsha Mawangdui sanhao Han muzhong chutu ditu di shuli jichu" (On the mathematical foundation of the maps excavated from Han tomb 3 at Mawangdui), *Keji Shi Wenji* 3 (1980): 85–92, esp. 86. Even granting that the instruments and geometry necessary for surveying had been developed by the Han, in speaking of early Chinese maps one must be wary of applying the word "survey" in its modern sense: gathering information about a well-defined area by the use of techniques applied consistently throughout. Much of the information reflected on the Mawangdui maps, for example, could have been obtained from direct observation, but it might have been gathered in patchwork fashion, in bits and pieces, not systematically, from several sources: direct measurements, existing records, even local lore about travel time. All of this information could be combined, compared, and adjusted to create a map giving approximate locations with the same accuracy as the Mawangdui maps. There are European examples of this.

32. Mills, however, traces the map to Mao Kun (1512–1601), Mao Yuanyi's grandfather, who was a member of an admiral's staff. Mills believes the map was the work of a cartographer and his assistants who

The chart depicts a voyage from Nanjing to the island of Hormuz to ports on the east African coast. It is thought to have been originally a strip measuring about 20.5 by 560 centimeters, with the image on it divided into forty sheets when included in the *Wubei zhi*. The strip format has been found to result in angular, linear, and directional distortions. The orientation of the chart, for example, changes frequently (fig. 3.20), and the map scale has been found to vary from section to section according to the amount of detail represented. Sea routes are depicted with broken lines, and sailing instructions are given in notes on the chart. Some scholars have checked the instructions against modern charts and found that, in contrast to the map image, the instructions are accurate for the most part with regard to distance and direction.[33] The chart is thus taken as evidence of sophisticated navigational techniques based on astronomical observations and the use of the magnetic compass.

Astronomical techniques also reached a high level of development. During the Tang and Yuan, for example, the Chinese have been credited with what are interpreted as geodetic surveys. The Tang survey involved observations from a series of stations forming a chain about 3,800 kilometers long. The survey determined, among other things, that a north-south distance of about 351 *li* corresponded to a change of one degree in the altitude of the Pole Star. This information, some have speculated, was used to produce large-area maps such as the *Yu ji tu*.[34] The Yuan "survey of the four seas" (*sihai ceyan*) was more extensive than the Tang survey, involving twenty-seven observation stations within an area covering about 5,000 kilometers from north to south and about 2,700 kilometers from east to west.[35] Measurements of the length of the sun's shadow at noon were taken, often with gnomons as tall as twelve meters (fig. 3.21). The determinations and measurements from these surveys were intended for the correction of calendars, but they had potential cartographic applications. From the length of the sun's shadow, for example, it is possible to compute latitude.

Because of their cartographic applications, potential or actual, the meridian "surveys" and navigation have been discussed in recent histories of Chinese cartography as indicative of its mathematical foundations. The only difficulty here is that the cartographic application of astronomical techniques has yet to be demonstrated, and the earliest evidence for the cartographic application of seafaring techniques exists in the *Wubei zhi*, which dates from the seventeenth century. Thus evidence of mensuration in fields often associated with cartography still does not give much support to the idea of a continuing tradition of measured mapping.

The Use and Abuse of Cartographic History: Flaws in the Quantitative Approach

The quantitative interpretation is tenable if one insists on linking mathematics and cartography, so that only those images that bear signs of measurement are considered cartographic and those associated with text are beneath cartographic consideration. Uniformity of scale, I agree, is important for achieving a certain kind of fidelity to geographic reality, one emphasizing the representation of linear distances. As I stated above, the pre-Han and Han artifacts can be interpreted as evidence that the idea of scale was understood. But there are some problems with that interpretation. For example, the deteriorated condition of some of the artifacts when excavated makes determination of exact scale difficult: there are gaps in the artifacts, and scale determinations can vary depending

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compiled the chart from earlier ones. Others have conjectured that the map had origins in the Islamic world. See Ma Huan, *Ying-yai Sheng-lan: "The Overall Survey of the Ocean's Shores" [1433]*, ed. and trans. J. V. G. Mills (Cambridge: Cambridge University Press, 1970), 239–41.

33. Mills, for example, remarks that in some cases the details on the chart are "astonishingly accurate," but he also finds that the instructions for the main voyage from Ceylon to Hormuz are "defective" and that the instructions for sailing along the east African coast are "rudimentary and inadequate." See Mills, *Ying-yai Sheng-lan*, 248 (note 32). Hsü Yü-hu finds the distance and bearing information to be "surprisingly" accurate for routes along the Southeast Asian coast. See Hsü Yü-hu (Xu Yuhu), *Mingdai Zheng He hanghai tu zhi yanjiu* (Study of Zheng He's nautical chart from the Ming period) (Taipei: Xuesheng Shuju, 1976), 7. The difference in opinions may be related to disagreement as to what distance corresponded to the Chinese *geng*, or watch, equal to 2.4 hours. Distance on the chart is given in terms of *geng*, and one's calculation of that distance will vary depending on how fast one believes a Chinese sailing vessel could travel. Estimates of sailing speed range from about twelve to twenty nautical miles per *geng*. A useful collection of studies on the chart is Zhongguo Hanghai Shi Yanjiuhui (Research Association for the History of Chinese Navigation), ed., *Zheng He yanjiu ziliao xuanbian* (Selected research materials on Zheng He) (Beijing: Renmin Jiaotong Chubanshe, 1985).

34. Arthur Beer et al., "An 8th-Century Meridian Line: I-Hsing's Chain of Gnomons and the Pre-history of the Metric System," *Vistas in Astronomy* 4 (1961): 3–28, esp. 16.

35. This "survey" is described in Song Lian et al., *Yuan shi* (History of the Yuan, compiled 1369–70), chap. 48; see the edition in 15 vols. (Beijing: Zhonghua Shuju, 1976), 4:1000–1001. The same history also records an attempt by Yelü Chucai (1190–1244) to correlate celestial measurements and terrestrial distance between Beijing and Samarkand. Yelü, an astrologer who served the Mongol leader Chinggis Khan, noticed a two- or three-hour time lag between celestial occurrences predicted in the official Chinese calendar, which had been made for use in Beijing, and their occurrence in Samarkand. To overcome this, Yelü compiled a new calendar for Samarkand, using an adjustment factor to calculate the time difference of astronomical phenomena observed in regions east or west of there. This factor, however, did not find cartographic application, though it could have been used to determine longitude in the Western sense of a geographical coordinate. See *Yuan shi*, chap. 52 (4:1119–20).

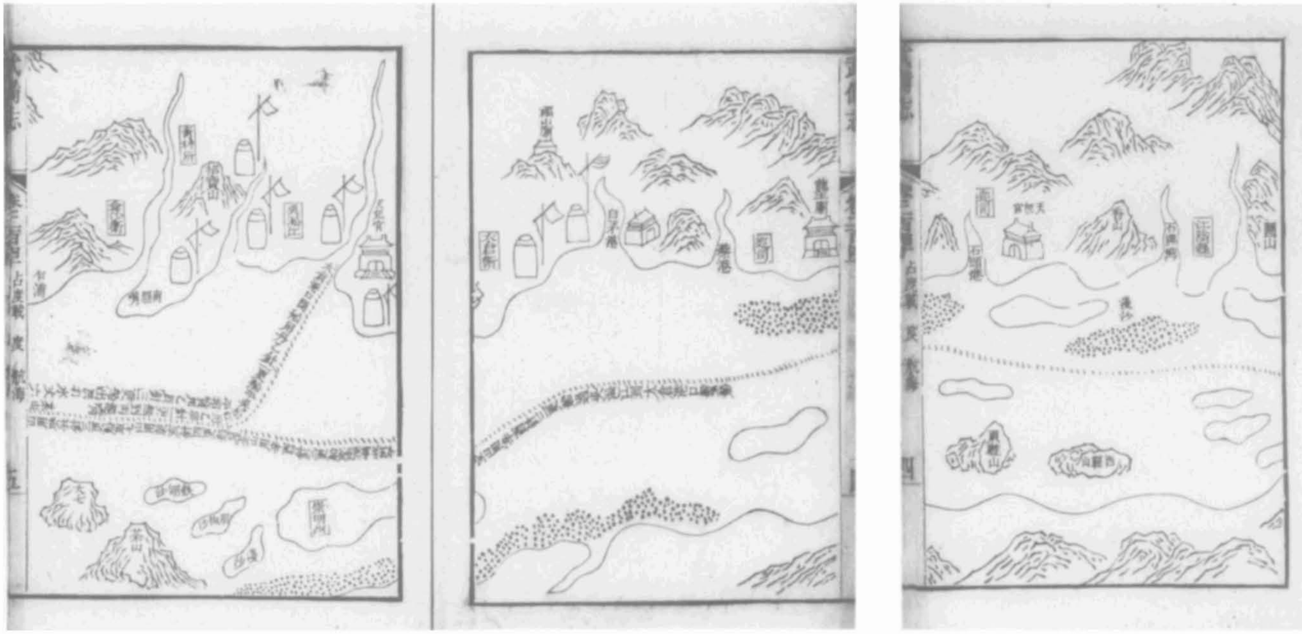

FIG. 3.20. NAUTICAL CHART FROM THE *WUBEI ZHI*. Shown here are the first six pages of the nautical chart, which cover the route from the Nanjing area to just south of the Huangpujiang (Whangpoo River). The chart bears no scale indications, but notes give compass directions and sailing times for routes between various places. Orientation changes as one

on how one fills in those gaps. In the case of the Mawangdui maps, it is important to note that scale consistency decreases as one moves away from the center. It is not sufficient to consider absolute variation in scale across a whole map, as several researchers have done; one must also take into account the distribution of that variation. Some researchers on early Chinese maps have tried to establish uniformity of scale by hiding its variability, by giving the scale as a range. It also will not suffice to argue that the center is of main interest, and therefore that it is drawn to scale or exhibits a narrower range of scale variation. For defense purposes, which the garrison map is thought to have served, the periphery might very well have been of main interest. There is not enough evidence, in either case, to judge. We should also remember as we consider the scales given for the early maps that none of the artifacts in question bears an expressed scale, and that the "rounding off" of the ratio may imply more systematizing than actually existed.[36]

In addition, emphasis on scale and accuracy has tended to divert attention from other questions about traditional Chinese mapping. For example, more attention could be paid to methods of graphic production. It seems that much of the technological basis for map production had been laid by the end of the Han dynasty. Maps continued to be produced with brush and ink on silk and paper, and to be engraved on various media, up to the twentieth century. This continuity is one reason for not dividing up Chinese cartographic history into dynasties. As far as methods of graphic production are concerned, there was one technological innovation: the development of woodblock printing during the eighth century, which made it easier to reproduce and thereby to disseminate maps. Thus, after the tenth century we have many more maps extant than for earlier periods.

One should also note that the same methods of production were employed in the graphic arts in general, so that it is possible to conjoin cartography and other visual arts. The failure to explore this connection has led to the devaluation of a large body of artifacts that fall within our definition: "graphic representations that facilitate a spatial understanding of things, concepts, conditions, processes, or events in the human world."[37] If one views Chinese artifacts with this definition in mind, one gets a

36. Han Zhongmin has suggested that too much emphasis has been placed on ascertaining the accuracy of the Mawangdui maps. He proposes a different reconstruction of the garrison map, one that would result in a map of ninety-six by ninety-six centimeters instead of ninety-eight by seventy-eight centimeters. See Han Zhongmin, "Guanyu Mawangdui boshu gu ditu di zhengli yu yanjiu" (Concerning the restoration and study of the ancient silk maps from Mawangdui), in *Zhongguo gudai ditu ji*, ed. Cao Wanru et al. (Beijing: Wenwu Chubanshe, 1990–), 1:12–17. Curiously, no illustration of Han's proposed reconstruction appears. Han does imply that the map would no longer be as accurate as is thought: his reconstruction apparently would alter the degree of correspondence between the map and the area it supposedly depicts.

37. Preface to *The History of Cartography*, ed. J. B. Harley and David Woodward (Chicago: University of Chicago Press, 1987–), 1:xvi.

moves across the map. On the first two pages, starting from the right, south-southeast is at the top. On the third, fourth, and fifth pages, south is generally at the top. On the sixth page, west is at the top.

Size of each page: ca. 14.5 × 10 cm. Courtesy of the Asian Division, Library of Congress, Washington, D.C. (F701.M32.1).

different impression of Chinese mapmaking—that scale maps tend to be isolated examples.[38] One might object that looking at artifacts with a broader conception of maps is merely another instance of arbitrariness, of imposing a different preconception on Chinese artifacts. A broader conception, the following chapters show, is sanctioned by the context: the artifactual record itself demands a broader understanding of the map. A focus on scale mapping is insufficient to account for the broad range of production and the variety of representational practices. Furthermore, what are taken to be scale maps often have much in common with artifacts not usually regarded as cartographic. The modes of representation on the Mawangdui maps, for example, appear less striking when one sees similar curves representing mountains on a map of a burial site dating from the tenth century and bearing no scale indications (fig. 3.22).

Since the artifacts singled out for attention under the quantitative interpretation are viewed as instances of scale mapping, they are regarded as "scientific" and as serving secular, utilitarian purposes. Thus they are described as topographic military, economic, or administrative maps. Such descriptions, however, tend to overlook the contexts in which the artifacts were found—for example, tombs of members of the ruling class. The placing of maps in tombs seems to confirm that the functions of maps from at least the Han went beyond the secular (see pp. 77–80). It is clear from literary sources, cited in detail in the following chapters, that maps did serve utilitarian purposes, such as administration and military planning. But textual and artifactual evidence makes it clear that, for the literary elite, maps also served religious functions. They could depict the arrangement of implements used in rites. They could be used to locate auspicious sites for buildings. They could serve as talismans to ward off demons or as representations of power to secure passage to the otherworld. They could record astrological information and thus help interpret heavenly signs.

All this suggests that to understand early Chinese maps, we need to study them in the context of the beliefs and values of the ruling elite, not "abuse" them by imposing modern conceptions of cartography. As is described elsewhere, maps in Chinese culture were used not only for representing distances, but also for demonstrating power, for education, and for aesthetic appreciation. A conception of Chinese cartography as a rational, mathematical discipline for understanding space has led to a failure to

38. The range of cartographic styles in traditional China is suggested by the artifacts collected in *Zhongguo gudai ditu ji*, ed. Cao et al. (note 12). Many of the maps illustrated in this atlas have no expressed scale and are highly pictorial. The maps selected for extended analyses, however, are generally those that researchers are able to evaluate in terms of accuracy and scale—namely, those that support the notion of progress within a quantitative tradition. The atlas is useful for collecting a large number of Yuan and pre-Yuan maps, but it also represents a missed opportunity to examine the Chinese map tradition whole. Here I attempt to correct the imbalance.

FIG. 3.21. YUAN OBSERVATIONAL TOWER. This observational tower in Dengfeng Xian (in present-day Henan Province) once contained a gnomon about twelve meters tall. Extending horizontally on the ground from the north side of the tower is a graduated scale more than thirty-six meters long, which was used to measure the sun's shadow.

From Zhongguo Shehui Kexueyuan Kaogu Yanjiusuo (Archaeological Research Institute, Chinese Academy of Social Science), *Zhongguo gudai tianwen wenwu tuji* (Album of ancient Chinese astronomical relics) (Beijing: Wenwu Chubanshe, 1980), 14.

consider the full range of cartographic functions. It also leads to an anomaly: if the all-important goal was scale mapping, the preservation of such disparate images as the *Hua yi tu* and *Yu ji tu* on the same stone stele seems somewhat curious.

One researcher attempts to explain this by identifying two "parallel" traditions of Chinese cartography, one mathematical or "analytic" and the other "descriptive."[39] The former is concerned with measurement and is therefore a "science"; the latter is concerned with "information" and less concerned with accuracy. There is, however, no evidence that Chinese mapmakers saw themselves as working in two traditions distinguished by their attention to measurement, and the identification of two traditions still does not explain why parallel traditions would meet on the same stone. In the history of cartography, there are, to be sure, many examples of maps from different traditions appearing side by side. In Renaissance atlases, for example, Ptolemaic and "modern" world maps appear together. But in such instances the two types of maps are both predicated on the importance of mathematical representation to cartography. This does not seem to be the case with the two twelfth-century stone maps at Xi'an. The claim advanced by advocates of the quantitative approach is that these maps represent qualitatively different ways of mapmaking, one more advanced, more scientific than the other. Thus, one might argue that the maps on the stone stele are products of a transitional period.

The problem with that interpretation is that ten centuries seems rather long for a transition, and that the transition, as we will see below, does not seem to have been fully realized. The evidence does not support the view that Chinese maps were perceived within their cultural contexts as representing different traditions. Maps like the *Hua yi tu*, in short, were not regarded as inferior to maps like the *Yu ji tu*.

The preservation of both maps on the same stone sug-

39. See Hsu, "Han Maps," 56–59 (note 13).

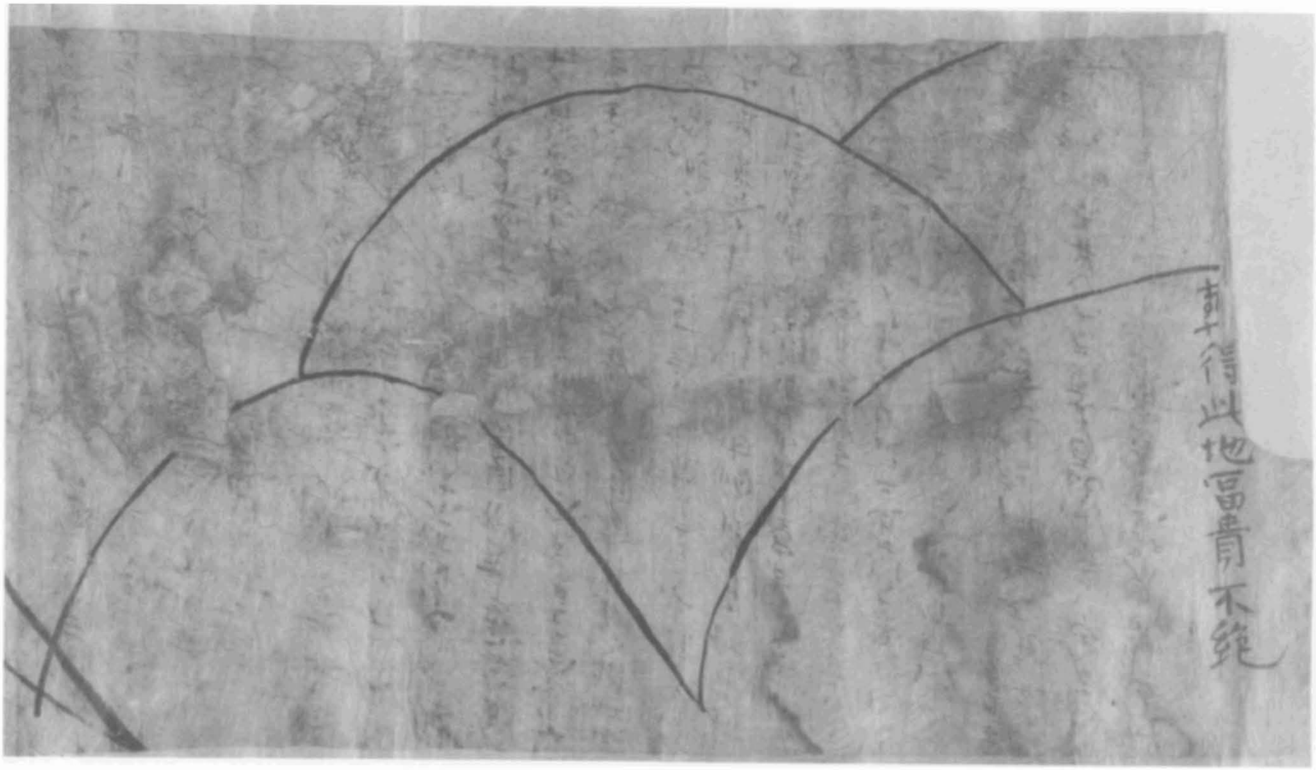

FIG. 3.22. MAP OF AN AUSPICIOUS SITE FOR A FAMILY TOMB (DETAIL). This map, discovered at Dunhuang in the Cave of the Thousand Buddhas, was drawn perhaps in the tenth century. A note on the map says: "Anyone buried here will have good fortune." Size of the entire original: ca. 25 × 229 cm; this detail: 24 × 39.5 cm. By permission of the British Library, London (Stein no. 3877 [Dunhuang MS. 6971]).

gests that considerations other than scale and mathematical correspondence to geographic actuality were considered important for mapmaking. The artifactual record provides ample evidence to undermine the idea that the *Yu ji tu* established a foundation for a climax of mathematical cartography during the Yuan and Ming, or that there was a general advance in measured mapping from the twelfth through the seventeenth century.[40] The maps in the *Lidai dili zhizhang tu* (Easy-to-use maps of geography through the dynasties, 1098–1100, supplemented 1162), for instance, are roughly contemporaneous with the *Yu ji tu* but do not adhere as closely to geographic actuality. China's outlines are depicted as being more squarish than they really are, and the Shandong peninsula almost disappears (figs. 3.23 and 3.24). Furthermore, islands representing other countries are nestled in an encircling ocean.

From a quantitative point of view, the image does not necessarily improve with later maps, for example, those in the *Da Ming yitong zhi* (Comprehensive gazetteer of the Great Ming, 1461). According to the gazetteer's preface composed by the emperor Yingzong (r. 1436–49, 1457–64), the work of compiling geographic information for the gazetteer began when the emperor Chengzu (r. 1403–24) ordered scholars to gather maps and documents from the empire's prefectures and towns and to combine them into one work.[41] This project was not completed, however, until the emperor Yingzong resumed the project, which was completed in 1461.

The main body of the comprehensive gazetteer opens with a preface to a "comprehensive map" of the empire and contiguous lands (fig. 3.25). The compilers of the gazetteer state that they provided this map at the beginning of the work so that one could "turn to the map and view the entire world, and the extent of the territory would be clearly in view as if one were looking at one's own palm."[42] The gazetteer was based on more than thirty years of information gathering, but the quality of

40. Exponents of the view that traditional Chinese cartography reached its peak during the Yuan and Ming include Joseph Needham and, more recently, Lu Liangzhi. See Needham, *Science and Civilisation in China*, 3:551–56 (note 21); and Lu, *Zhongguo dituxue shi*, 99 (note 20).

41. See the emperor's preface to Li Xian et al., *Da Ming yitong zhi*, 1b; see the edition in 10 vols. (Taipei: Tailian Guofeng Chubanshe, 1977), 1:2.

42. Li et al., *Da Ming yitong zhi*, preface (by compilers), 2b (1:56) (note 41).

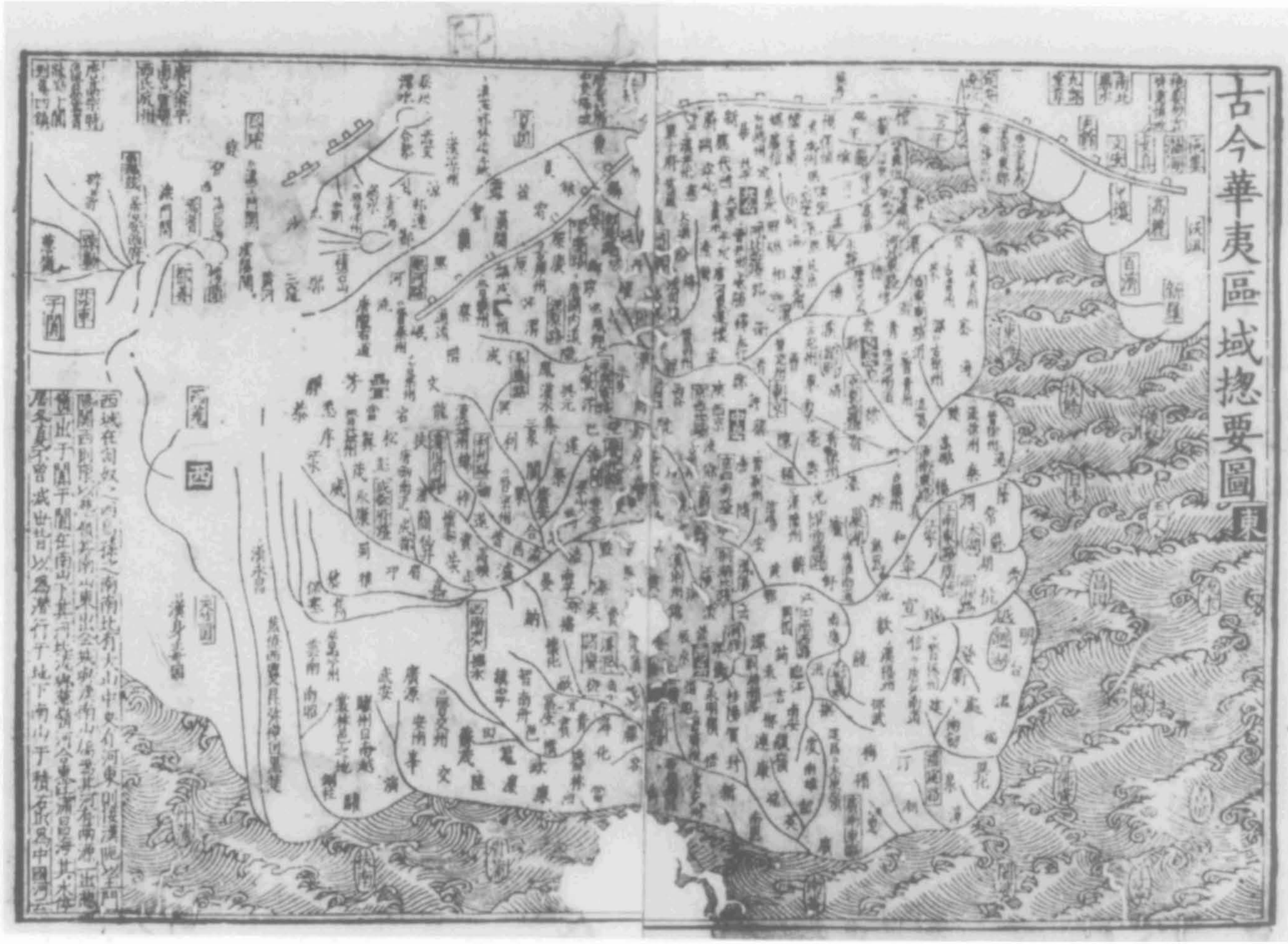

FIG. 3.23. "GUJIN HUA YI QUYU ZONGYAO TU" (GENERAL MAP OF THE ANCIENT AND PRESENT TERRITORIES OF CHINA AND FOREIGN COUNTRIES). This map is from the *Lidai dili zhizhang tu*, a collection of forty-four historical maps of dynastic territories from the time of Ku, legendary male ancestor of the Shang, to the Song dynasty. Each map is accompanied by explanatory notes. The maps shown here and in figure 3.24 are from a Southern Song edition.
Size of the original: unknown. Photograph courtesy of Cao Wanru, Institute for the History of Natural Sciences, Academia Sinica, Beijing.

the geographic information reflected in the general map does not quite fulfill the compilers' intentions. According to the criteria of the quantitative approach, the map represents a step backward from the two stone *Yu ji tu*, which predate the gazetteer by more than three hundred years. The Ming map is less detailed than the Song map, particularly in the depiction of the courses of rivers and the configuration of the coastline. Unlike the Song map, the Ming map lacks a grid and shows Yunnan and even what is now Tibet as having a coastline. The Ming map also makes greater use of pictorial elements, notably in the representation of mountains, which are merely named on the Song map.

The high degree of generalization in the Ming map may be at least partly explained by its extensive textual supplementation. The Song map has very little textual accompaniment; the cartographic image is dominant. In contrast, despite the importance attached to visual representation in the emperor's order, maps actually constitute only a small portion of the *Da Ming yitong zhi*. The work contains fifteen other maps besides the general map discussed above, so that maps occupy a mere thirteen leaves out of more than 2,800. These fifteen maps represent subdivisions of the territory depicted on the general map—the two capital districts and thirteen provinces—and introduce textual descriptions of the geographic subdivisions.[43]

43. The text itself subdivides these divisions further and is organized into a series of treatises, most devoted to a single prefecture (*fu*) or tributary state. The treatises are further subdivided into sections on topics such as local history, geography, and customs, as well as famous officials, itinerant scholars, exemplary women, and Daoist and Buddhist clergy. Such categories of information became standard in later gazetteers.

FIG. 3.24. "TANG YIXING SHAN HE LIANGJIE TU" (MAP OF THE TWO BOUNDARIES FORMED BY MOUNTAINS AND RIVERS ACCORDING TO YIXING OF THE TANG). The map illustrates Yixing's idea that the mountains and rivers of China formed two natural boundaries that defended against foreign invaders. The map shows two mountain ranges running from west to east, converging at Taihua Shan and then separating again. One is labeled "northern defense," and the other "southern defense." From the *Lidai dili zhizhang tu* (see fig. 3.23).
Size of the original: unknown. Photograph courtesy of Cao Wanru, Institute for the History of Natural Sciences, Academia Sinica, Beijing.

The ratio of image to text in traditional Chinese geographic works varies, but it is not uncommon to find a disproportionate amount of text. One example is the *Guang yutu* mentioned earlier, which consists of a book made up mostly of textual accompaniment to maps: about one hundred pages of maps and about three hundred pages of notes. Another is the *Gujin xingsheng zhi tu* (Map of advantageous terrain past and present).[44] This map was printed from a woodblock in 1555, making it contemporaneous with Luo Hongxian's *Guang yutu*. Unlike the *Guang yutu*, however, the *Gujin xingsheng zhi tu* lacks an expressed scale as well as the square grid (plate 1). One might claim that this difference is related to function.[45] The *Gujin xingsheng zhi tu* is heavily annotated with information regarding changes in toponyms and administrative status, and this feature combined with its title might suggest that it was meant to aid historical scholarship, not to provide a sense of distances. The problem with this line of argument is that the *Guang yutu* also provides historical information about the places it describes. It too could serve as a reference for historical scholarship and was itself based on such scholarship.

The grid on the general map of the empire in the *Guang yutu* raises questions of how seriously the grid was to be taken as a gauge of distance. Each square on the map is supposed to represent 100 *li*, or about 55 kilometers. Thus the distance from Xi'an to the coast directly east is given as about 600 *li*, or about 330 kilometers. This is about one-third the actual distance. The squares on the

44. This map is described in Ren Jincheng, "Xibanya cang Ming ke *Gujin xingsheng zhi tu*" (The *Gujin xingsheng zhi tu* printed during the Ming and preserved in Spain), *Wenxian* 17 (1983): 213–21.

45. As Ren has done in "Xibanya cang Ming ke *Gujin xingsheng zhi tu*," 214 (note 44).

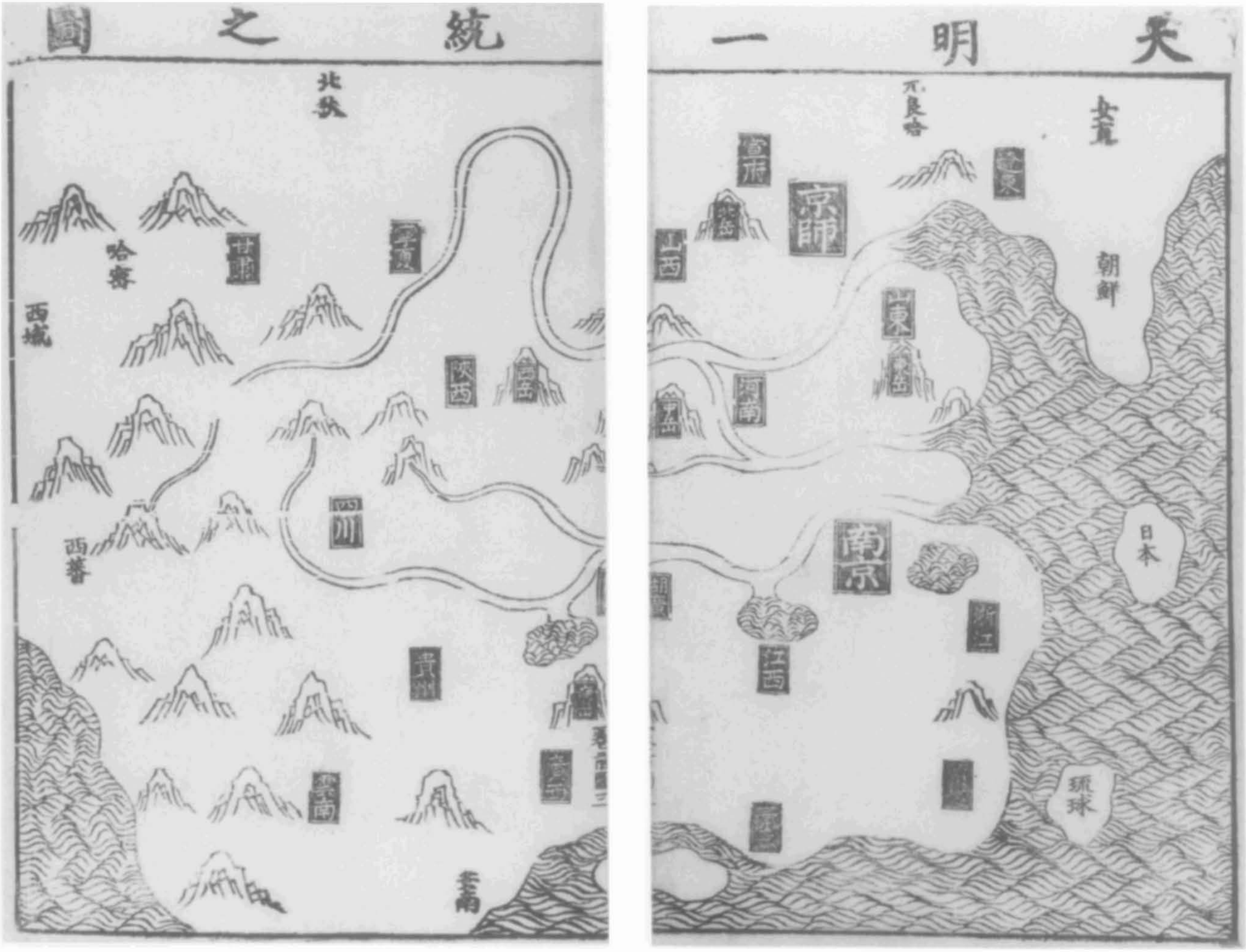

FIG. 3.25. MAP OF CHINA IN THE *DA MING YITONG ZHI*.
Size of each page: 26 × 18 cm. From Li Xian et al., *Da Ming yitong zhi* (completed 1461), prefatory chapter, unpaginated.
Reproduced courtesy of the Harvard-Yenching Library, Harvard University, Cambridge.

Yu ji tu (dated 1136) also represent 100 *li*, but the corresponding distance on the stone map is about 2,500 *li*, which is about one-third longer than the actual distance. Thus grid use on the *Guang yutu* and the maps based on it may be suspect as an indicator of the advanced state of scale mapping. In fact, not all mapmakers fully appreciated the utility of the square grid. In one edition of the *Guang yutu*, Fuchs has pointed out, some squares of the grid are elongated into rectangles, apparently in an attempt to fill wider pages.[46] Such elongated grids would still be of use as a scaling device, but uniformity of scale along the horizontal and vertical axes of the map would be lost.

The converse of what I said above about grids also needs to be heeded: the lack of scale or a grid on a map does not necessarily indicate a lack of geographic understanding or even a lack of utility. A case in point is the maps that often accompanied reports describing water conservancy projects. These were produced by regional and local officials and drawn using brush and ink. Like most traditional Chinese maps, they typically lack the square grid and scalar indications. This does not mean measurements were not performed. Quantitative information such as distances and dimensions was often written on paper strips, which were then pasted to the map (fig. 3.26). To appreciate the practical value of the map, one has to appreciate the complementary relationship between image and text, which might appear on the map itself or accompany it on separate sheets, as in a book.

46. Walter Fuchs, *The "Mongol Atlas" of China by Chu Ssu-pen and the Kuang-yü-t'u*, Monumenta Serica Monograph 8 (Beijing: Fu Jen [Furen] University, 1946), 21.

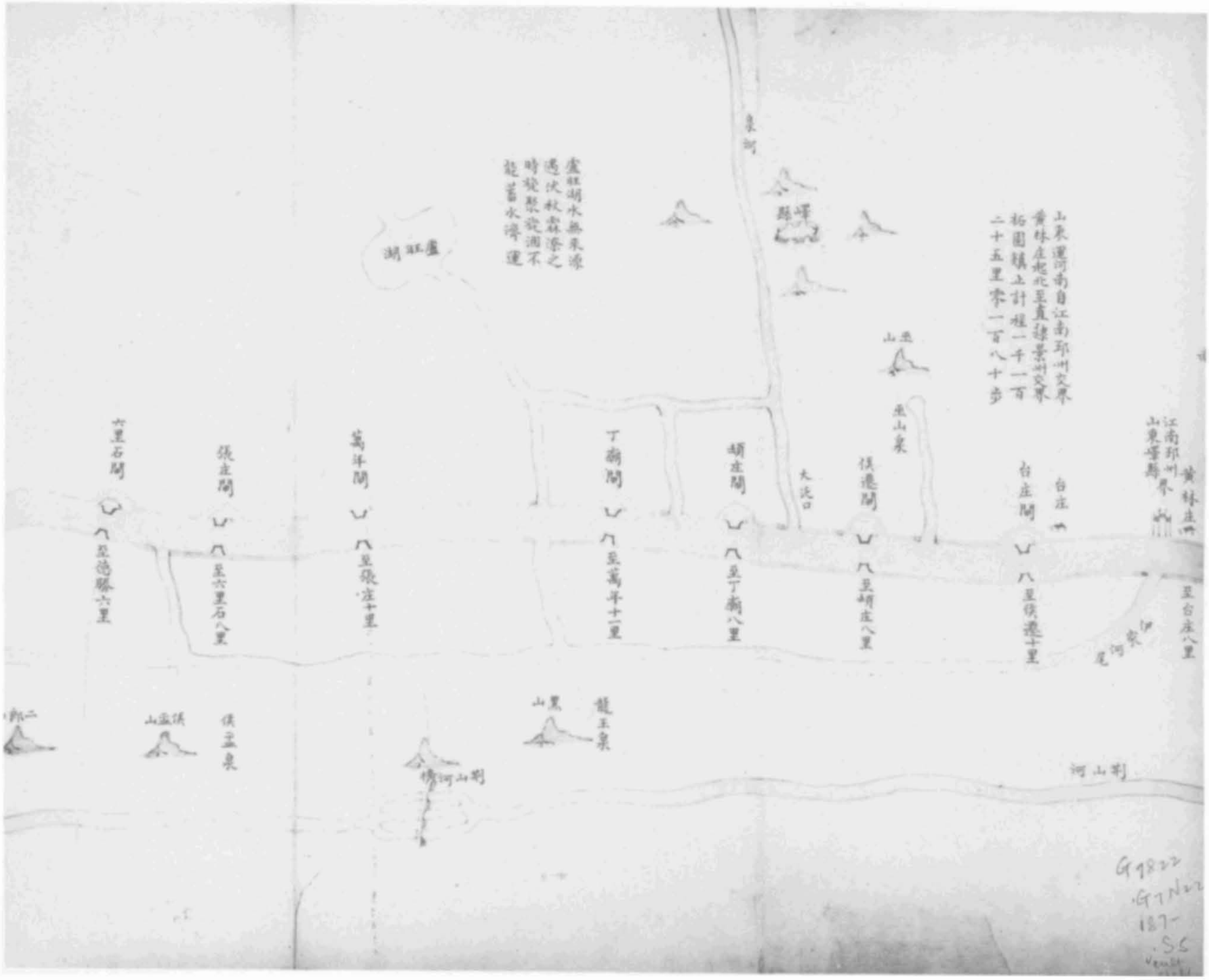

FIG. 3.26. WORD AND IMAGE ON A QING HYDROLOGICAL MAP (DETAIL). This map dating perhaps from the 1870s depicts the water control system on the Grand Canal in Shandong Province. It was drawn using watercolor and ink, and labels indicating distances were pasted on.
Size of the entire original: 23 × 382 cm. Courtesy of the Geography and Map Division, Library of Congress, Washington, D.C. (G7822.G7N22 187-.S5 Vault Shelf).

In studying Chinese maps, we may also have to adjust our norms of utility. Two nineteenth-century examples can help clarify what I mean. The first is a hydrological map depicting the Yangtze River and associated waterways in Hubei Province (plate 2). The second is a map of the city of Hangzhou (fig. 3.27). The hydrological map is largely planimetric and shows signs of measurement: notes give distances between certain landmarks. The city map is also generally planimetric. So far there is nothing in these maps to undermine a quantitative interpretation, that is, not until one considers a curious feature common to both maps. In certain places on these maps—in representing hills and buildings, for example—the mapmakers depart from a planimetric mode of representation and represent things pictorially in a manner highly suggestive of painting. These examples cannot be dismissed as aberrant, for pictorial representation in hydrological mapping goes back at least as far as the Yuan (fig. 3.28). Such examples also cannot be dismissed as the expression of nonutilitarian or decorative intentions. Even the nautical chart in the *Wubei zhi* represents coastal areas in a manner similar to landscape painting,[47] as do other maps used

47. Researchers bound to the quantitative interpretation have taken pains to explain away this feature. Niu Zhongxun, for example, says that the map distinguishes between smooth and rough islets, so that it shows a greater concern for the scientific than the artistic. See Niu Zhongxun, " 'Zheng He hanghai tu' di chubu yanjiu" (Preliminary study of Zheng He's nautical chart), in vol. 1 of *Zheng He xia Xiyang lunwenji* (Collected essays on Zheng He's expedition to the Western Ocean), ed. Zhongguo Hanghai Shi Yanjiuhui (Research Association for the History of Chinese Navigation) (Beijing: Renmin Jiaotong Chubanshe, 1985), 238–48, esp. 243.

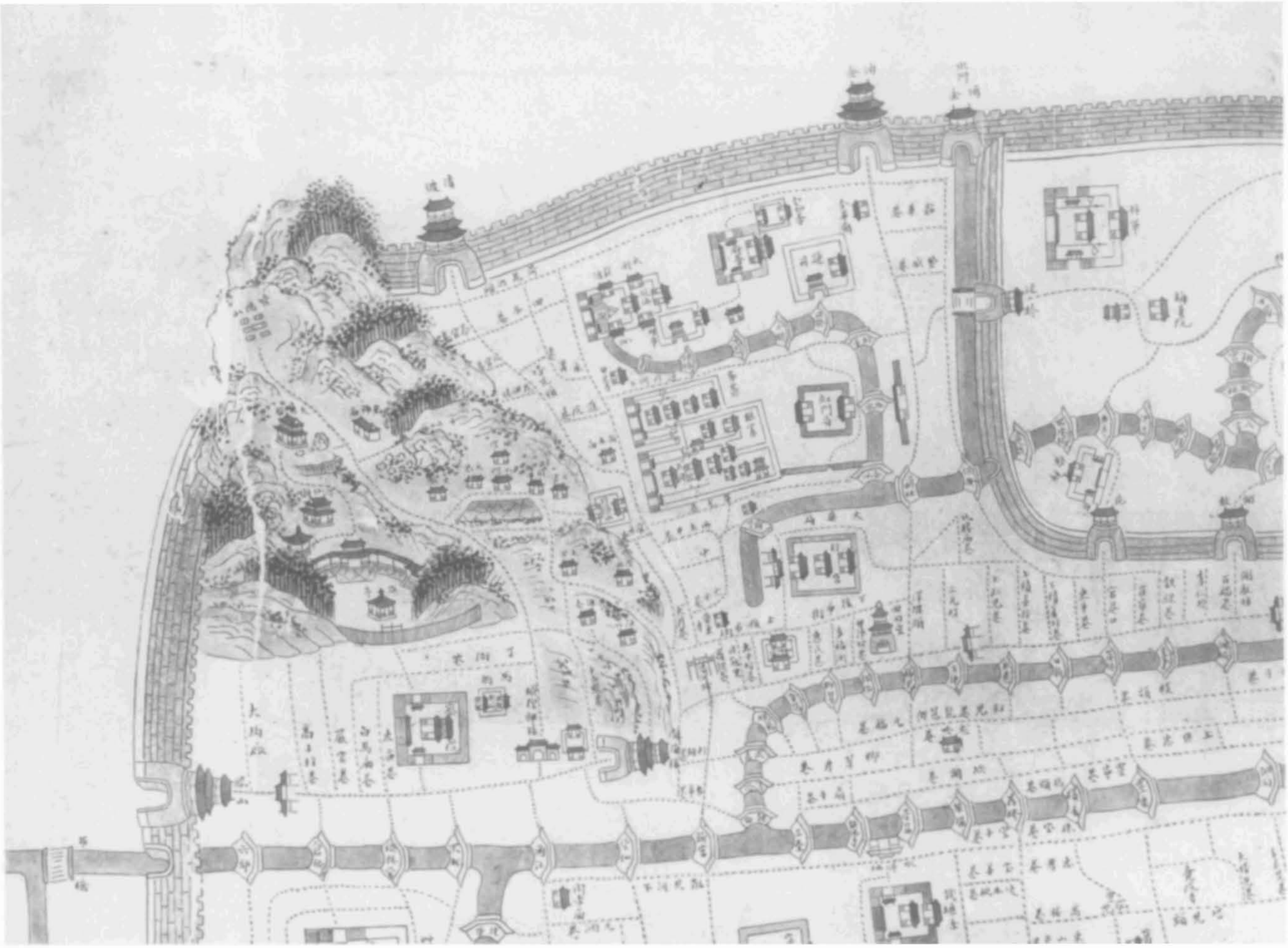

FIG. 3.27. DETAIL FROM THE *HANGZHOU CHENG TU* (MAP OF HANGZHOU). This map of Hangzhou dates perhaps from the nineteenth century. North is to the right. Streets are drawn in plan, while buildings, temple grounds, and gates are represented pictorially. Shown here is the southwest corner of the city, where the landscape is dominated by hills.
Size of the entire original: 63 × 94 cm. Courtesy of the Geography and Map Division, Library of Congress, Washington, D.C. (G7824.H2A5 18--.H3 Vault Shelf).

for navigation (plate 3). In addition, coastal defense maps from as late as the nineteenth century are often drawn in a pictorial manner (plate 4 and fig. 3.29). What we seek to understand in the following chapters is why. It is also curious to find these examples of pictorialism so late in the imperial period, when European methods supposedly supplanted the traditional methods.

Conversely, a planimetric mode of representation does not always indicate practical function. A case in point is a map of Jingjiang Fu Cheng (Prefectural City) carved on the stone cliff of Yingwu Shan (a mountain north of Guilin) in 1271–72 (fig. 3.30). Construction of the city began in 1258 to provide a defensive bulwark against Mongol forces. The city walls were completed before 1270, and the map was engraved shortly afterward. The city fell to the Mongols in 1277. The engraved surface measures about 340 by 300 centimeters. It shows some of the main streets of the city, along with moats, city walls, watchtowers, and gates. Because of the prominence given to features of military importance, some have interpreted the map as serving defensive purposes.[48] But this interpretation is not convincing, since the map was carved outside the walls of the city even as the Mongols were advancing. In addition, qualities often associated with "military" maps—flexibility, portability, and secrecy—are not among those of the map of Jingjiang Prefecture. Its engraving on stone suggests a commemorative function similar to that of the *Yu ji tu*.

If being engraved on stone is an indication of value,

48. See Chen et al., *Zhongguo gudai dilixue shi*, 309 (note 17); and Lu, *Zhongguo dituxue shi*, 152 (note 20).

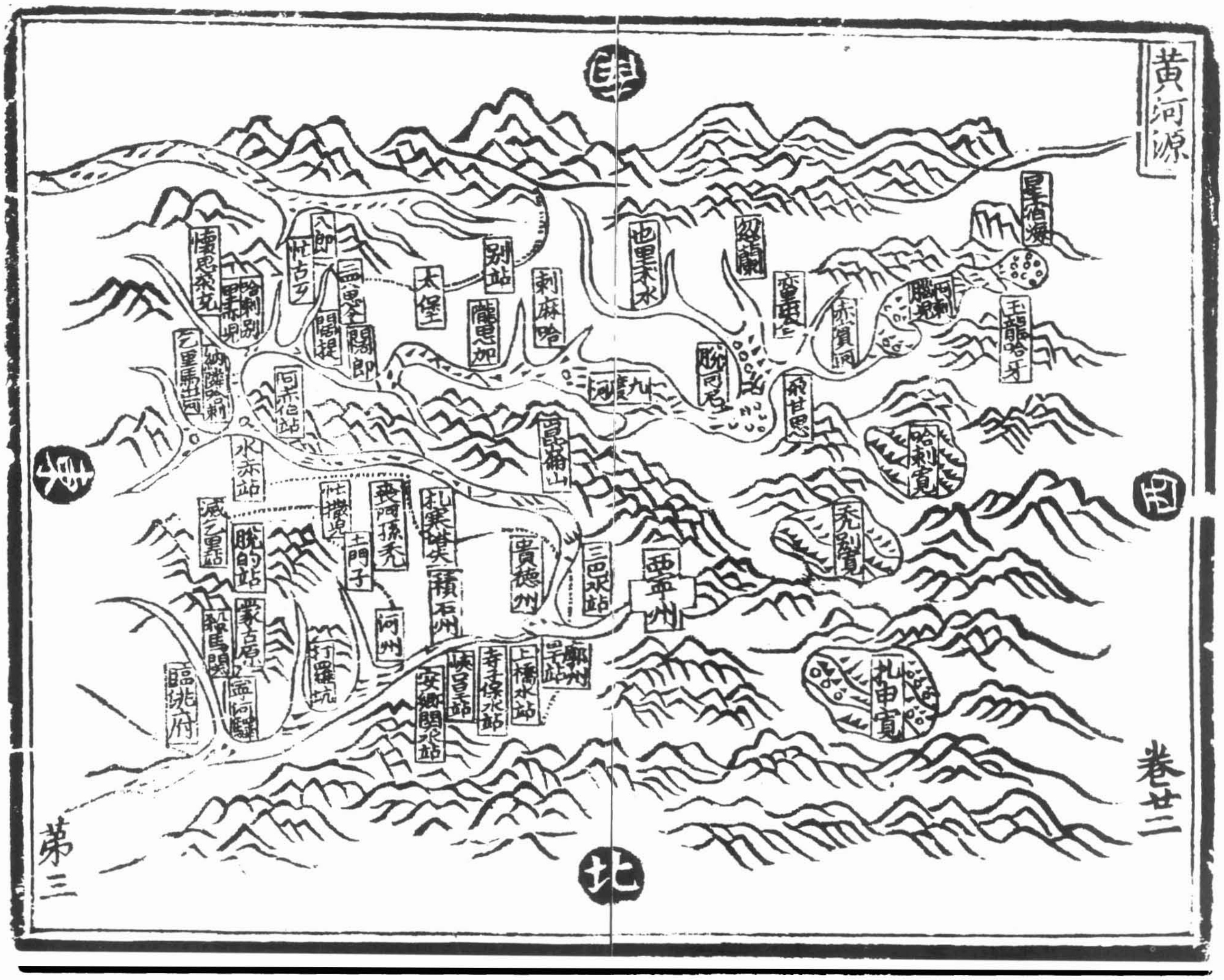

FIG. 3.28. MAP OF THE SOURCE OF THE YELLOW RIVER. This map was based on information in the *Heyuan zhi* (Treatise on the source of the Yellow River, 1315) by the geographer Pan Angxiao (fl. thirteenth century). South is at the top. Size of the original: 13.5 × 17.4 cm. From Tao Zongyi, comp., *Nancun chuogeng lu* (Notes taken by Nancun [Tao Zongyi] while at rest from plowing, 1366), *Sibu congkan* edition, 22.3a–b.

moreover, then it is clear that planimetric maps like the *Yu ji tu* and *Hua yi tu* were not the only ones considered worthy of long-term preservation. Two maps of the sacred mountain Hua Shan (Mount Hua) in Shaanxi Province—one from the Ming and one from the Qing—illustrate this point (figs. 3.31 and 3.32). Both make use of pictorial representation, and both have no expressed scale—characteristics not valued by proponents of a quantitative tradition. But both show clear signs of intent to convey knowledge of place: on both maps, place-names are given. In addition, pictorial representation was not necessarily perceived as detracting from the maps' utility. An inscription on the Ming map says the map was made as an aid to the visitor to the mountain. Bearing this out, the map depicts climbing paths, steps cut into the sides of cliffs, and bridges over gaps.

Pictorial maps, of course, did not serve only practical purposes. On the Qing map of Hua Shan, a number of "supernatural" features are emphasized; a palm print of a giant on the east peak, an image of a transcendent being on the west peak, and between them a waterfall interrupted by a cavern. The Qing map differs from the Ming map in its depiction of man-made objects: as Munakata has pointed out, it deemphasizes them through the use of thin lines so they are overwhelmed by the natural landscape.[49] The intended result seems to be a mixture of awe and humility.

The artifactual record suggests that scale mapping was not the primary concern of Chinese mapmakers, although

49. Kiyohiko Munakata, *Sacred Mountains in Chinese Art* (Urbana: University of Illinois Press, 1991), 57.

FIG. 3.29. DETAIL FROM THE *WANLI HAIFANG TU* (TEN THOUSAND *LI* MAP OF MARITIME DEFENSES, 1705?). This map represents the Chinese coast from Hainan Island to the Liaodong peninsula. It bears notes on defense establishments and makes some policy recommendations. Garrisons and military bases are indicated by flagpoles. Coastal fortresses and prefectural cities are represented by pictorial signs, as are mountains. North is to the left.
Size of the entire original: 30 × 274 cm. Courtesy of the Geography and Map Division, Library of Congress, Washington, D.C. (G7821.R4 1705.W3 Vault Shelf).

they certainly understood its principles. What links the maps claimed for a mathematical tradition with the vast body of nonmathematical artifacts is the close relation between word and image. The *zhaoyu tu*, the Fangmatan wooden maps, the Mawangdui silk maps, and the Ming navigational chart, we should recall, all lack scale indications. Distances are given in notes on the maps themselves. With later maps, such as the *Guang yutu*, the textual accompaniment could fill up chapters of books. In addition, as is documented in subsequent chapters, the figures described above as advocates of quantitative cartography all recognized a complementary relationship between image and text. Previously this characteristic of Chinese cartography has been regarded as a hindrance to the development of an independent science of cartography in China. Wang Yong, for example, labels maps that rely on textual accompaniment, employ pictorial representation, and lack grids as "immature and backward."[50]

The same attitude toward text characterizes recent research on the nautical chart in the *Wubei zhi*. One researcher states that it is the first nautical chart that can be used without lengthy textual explanation, a characteristic that anticipates modern charts.[51] This assertion cannot be maintained when one considers that without the lengthy notes on the map itself, the map would be of little use for navigational purposes. The orientation and scale of the image vary across the map, and the notes make one aware of the changes. The textualism seen on the nautical chart, as I argue in a later chapter, was seen as essential to mapmaking, and far from indicating backwardness, it was a sign of scholarly rigor.[52] Given the relative paucity of cartographic images drawn to scale in the existing corpus, one can surmise that textual sources provided much of the information for maps like the *Yu ji tu*. Thus attempts to isolate such maps from the nonmathematical artifacts by claiming that makers of unmeasured maps were not interested in the method of presentation seem forced.[53] Mapmakers could express their concern for measurement in different ways, and they had available different methods of presentation for different purposes.

50. Wang, *Zhongguo ditu shi gang*, 50 (note 26). Elsewhere Wang makes a distinction between maps accompanied by text and "pure maps" (*Zhongguo dilixue shi*, 74 [note 1]). Recently, however, there have been some signs that this disparaging attitude toward the relation between cartographic image and text may change. At the conclusion of a study of the Mawangdui maps, Han Zhongmin mentions that for the most part the achievements of Chinese surveying were not integrated into traditional Chinese mapmaking. He attributes this to the use of textual descriptions and to the influence of Chinese painting. Unfortunately, he does not develop these ideas beyond posing the question whether the influence of painting on mapmaking is a reflection of China's long "feudal" history. See Han, "Guanyu Mawangdui boshu gu ditu di zhengli yu yanjiu," 16–17 (note 36). Han's reticence is understandable, since he is a scholar holding a decidedly unorthodox opinion in a political system not very tolerant of heterodoxy. Another scholar who has foreshadowed my work here is Tan Qixiang. In his preface to the *Zhongguo gudai ditu ji* (note 12), Tan devotes several paragraphs to the connection between textual scholarship and Chinese geography. He points out the importance of maps to the documentary culture of traditional China. On this see pp. 73–77.

51. Zhu Jianqiu, " 'Zheng He hanghai tu' zai woguo haitu fazhanshizhong di diwei he zuoyong" (The place and role of Zheng He's nautical chart in the history of the development of our country's nautical charts), in *Zheng He xia Xiyang lunwenji*, 1:229–37, esp. 231 (note 47).

52. The close relation between text and image is even more crucial to an understanding of Chinese religious mapping. Without consulting accompanying text, it is very easy to misread Daoist maps.

53. Hsu, "Han Maps," 59 (note 13).

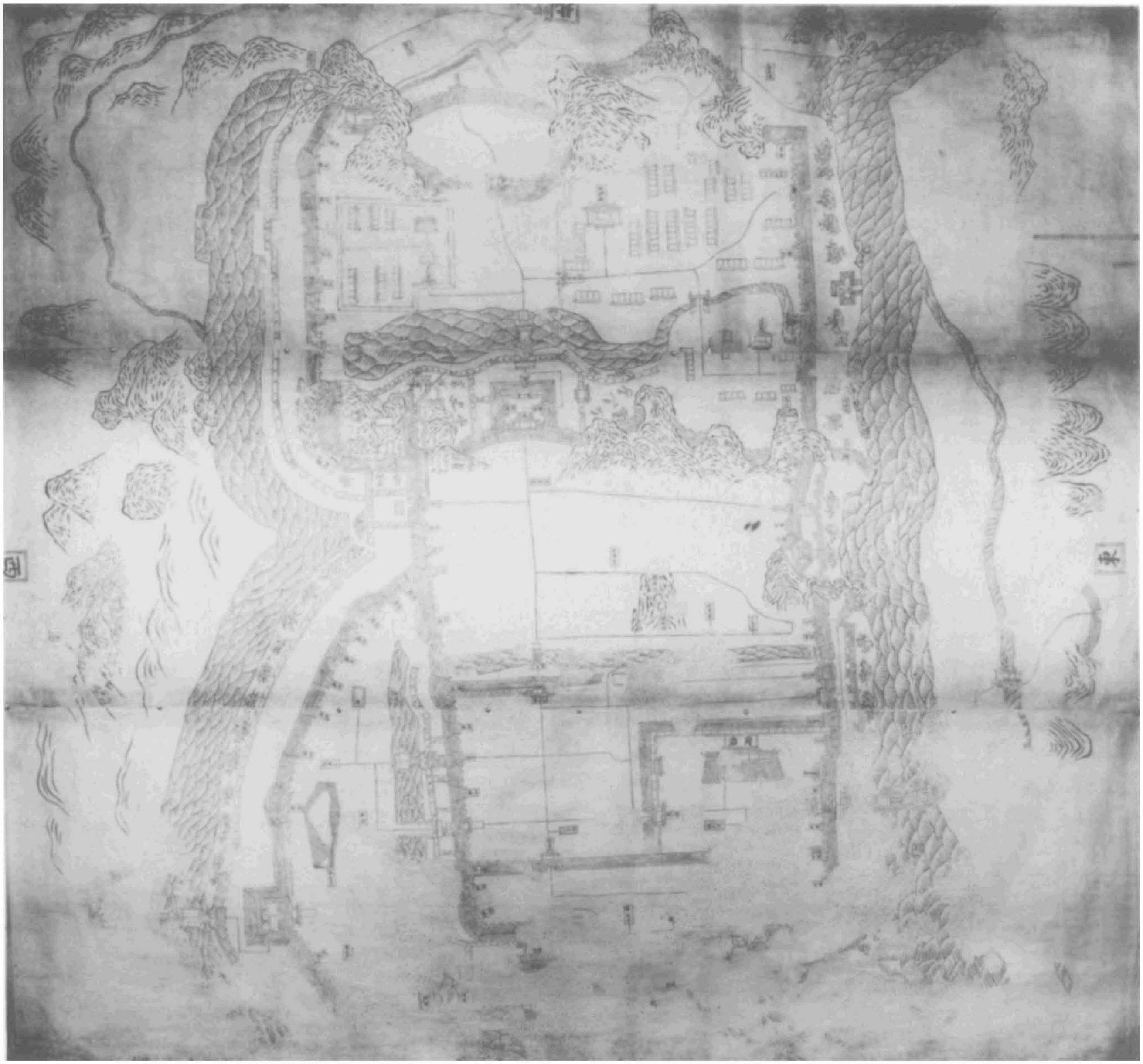

FIG. 3.30. MAP OF JINGJIANG PREFECTURAL CITY, 1271–72. A copy of the map carved on a cliff of Yingwu Shan, north of Guilin in Guangxi Zhuang Autonomous Region. North is at the top. Not shown on the copy is the upper part of the map, which contains annotations describing the construction of the city, listing its dimensions, recording the cost of labor and material, and identifying those in charge of the project. Size of the entire original: 300 × 340 cm. Photograph courtesy of Cao Wanru, Institute for the History of Natural Sciences, Academia Sinica, Beijing.

Toward a Revision of the Chinese Map Tradition

I therefore suggest that a quantitative interpretation of traditional Chinese cartography is inadequate for understanding what constitutes a map in Chinese culture. A Western model of scientific cartography has been pursued too rigorously in previous work on Chinese maps; its relevance even for Western cartography has come to be questioned.[54] The challenge in the following pages is to articulate a coherent alternative to that interpretation of Chinese cartography. In questioning it, I by no means imply that traditional Chinese cartography was deficient

54. See, for example, Stephen Toulmin, *Cosmopolis: The Hidden Agenda of Modernity* (New York: Macmillan, 1990), and David N. Livingstone, "Science, Magic and Religion: A Contextual Reassessment of Geography in the Sixteenth and Seventeenth Centuries," *History of Science* 26 (1988): 269–94.

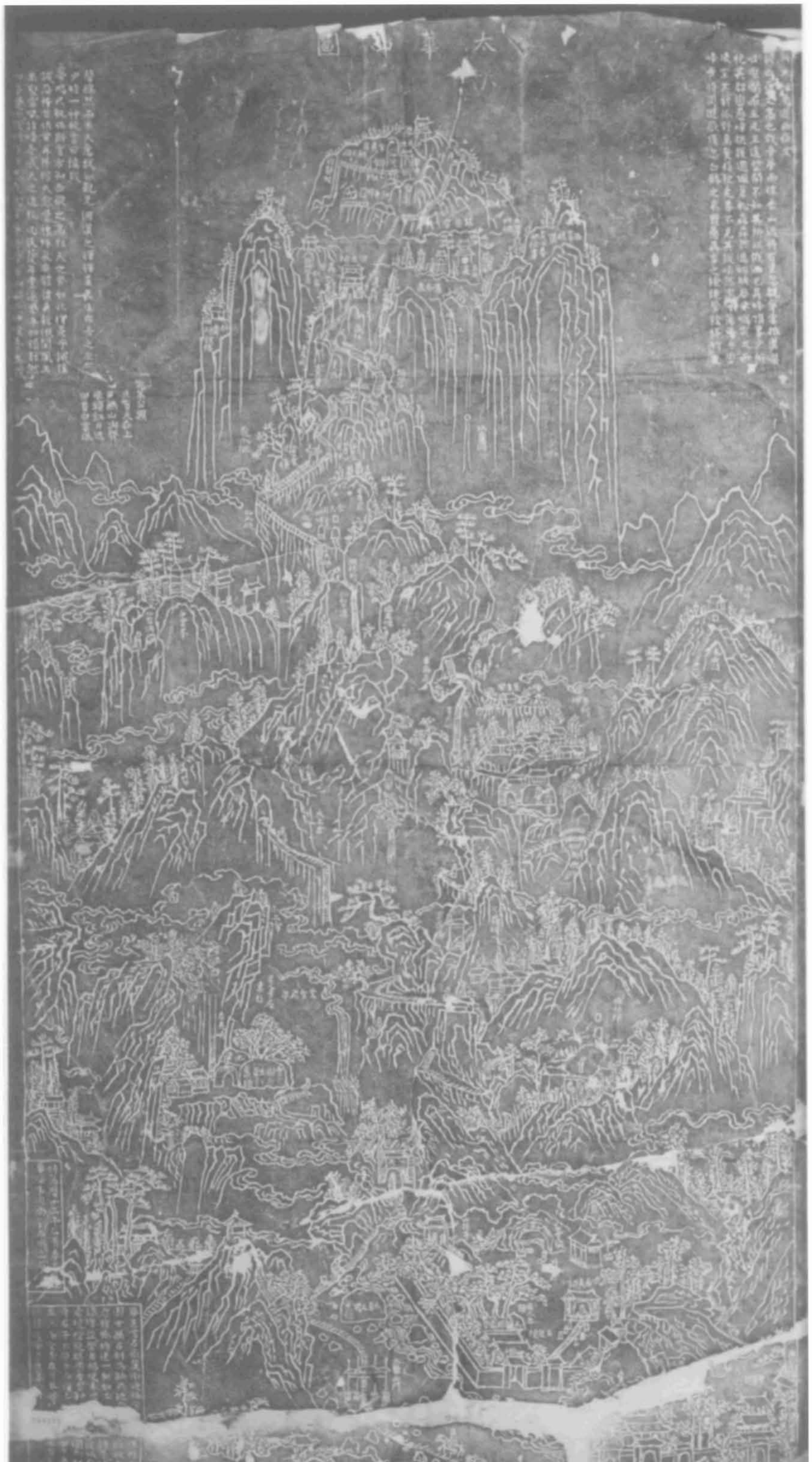

FIG. 3.31. RUBBING OF A STONE MAP OF HUA SHAN (*TAIHUA SHAN TU*), 1585. The map was made as an aid to visitors to the sacred mountain. The upper portion contains a prayer to the god of the mountain. The prayer was written by the first emperor of the Ming dynasty after he dreamed he was taken to the top of the mountain.
Size of the original: 113 × 60 cm. By permission of the Field Museum of Natural History, Chicago (244848).

or backward. What I mean to convey is that it needs to be understood on its own terms—terms that do not necessarily identify knowledge with number. Just what those terms are and how they affect the canon of traditional Chinese cartography will be discussed in the following chapters.

Those chapters attempt to construct an alternative history by establishing contexts for traditional Chinese geographic mapping. This has been done both by examining the maps themselves and by studying contemporaneous texts where available. The alternative history I am proposing is developed in four overlapping stages. The first deals with the political context of Chinese mapping. The second examines the roles of measurement and textual scholarship. The third explores the relation of traditional Chinese mapping to the arts. The fourth corrects the view that Chinese cartography fused with European cartography in the late imperial period. That view assumes that Chinese cartography was backward and prepared to make use of superior European techniques. In other words, that view of Chinese cartographic history rests on the mathematical interpretation I have begun to question here. My approach can be described as historicist in the sense that I have tried to reconstruct the purposes, functions, and contexts of traditional Chinese mapping practice. A possible objection to this approach is that it entails relativism, the notion that the validity or rightness of ideas is relative to a tradition and therefore that universal standards cannot be formulated. Historical reconstruction, however, need not lead to relativism; it may yield a kind of pluralism—the possibility that excellence in cartography can be measured by social, aesthetic, and even religious criteria as well as scientific ones, and that Europe did not hold a monopoly on all these forms of excellence throughout the history of mapmaking. This pluralism implies that modern cartography has something to learn about diversity of excellence from many traditions, not that of Europe alone.

We are just beginning to understand how to read traditional Chinese maps. According to the corrective view advanced here, Chinese conceptions of mapping differed enough from European ones to make assimilation difficult up till the end of the nineteenth century. It is not that Chinese mapping was nonmathematical, it was more than mathematical. Traditional Chinese conceptions of knowledge differ from those that have been applied to traditional Chinese maps in previous accounts. Traditional maps were products of scholarly enterprises, and under Chinese conceptions, they possessed intellectual value. Under those conceptions, a "good" cartographic image did not necessarily tell how far it was from one point to another. But it might, as is detailed in the following chapters, tell us about such things as power, duty, and emotion.[55]

FIG. 3.32. RUBBING OF A STONE MAP OF HUA SHAN (*TAIHUA QUAN TU* [COMPLETE MAP OF TAIHUA]), 1700. The map was made to commemorate a Qing official's climb up the mountain. The palm print on the east (left) peak of the mountain is larger than it appears on the Ming map (fig. 3.31).
Size of the original: 135 × 69 cm. By permission of the Field Museum of Natural History, Chicago (116470).

55. Modern high-precision maps often involve such things. A map labeling Tibet "Xizang," for example, says something different from one that labels it "Tibet." But insofar as such maps express political ideology, they are often regarded as departing from the scientific enterprise of cartography.

FIG. 3.33. REFERENCE MAP FOR THE STUDY OF CHINESE CARTOGRAPHY. This map shows the location of places in China mentioned in chapters 3–9.

APPENDIX 3.1 CHRONOLOGICAL LIST OF SELECTED MAPS, FOURTH CENTURY B.C. THROUGH THE YUAN DYNASTY

Name of Map, and Author (if known)[a]	Date	Dimension (cm)	Medium	Location	Figure Number in Text
Zhaoyu tu (mausoleum map or plan)	Produced between 323 and 315 B.C.	48 × 94	Bronze plate inlaid with gold and silver	Hebei Provincial Institute of Cultural Relics	Fig. 3.1
Seven maps found at Fangmatan[b]	Produced ca. 239 B.C.	26.7 × 18.1; 15 × 26.6; 18.1 × 26.5; 16.9 × 26.8	Ink on wood (four boards)	Gansu Provincial Institute of Archaeology and Cultural Relics	Figs. 3.2 to 3.4
Map fragment found at Fangmatan	Drawn ca. 179–141 B.C.	2.6 × 5.6	Ink on paper	Gansu Provincial Institute of Archaeology and Cultural Relics	Fig. 3.5
Topographic map found at Mawangdui	Drawn before 168 B.C.	96 × 96	Ink on silk	Hunan Provincial Museum	Fig. 3.8
Garrison map found at Mawangdui	Drawn ca. 181 B.C.	98 × 78	Ink on silk	Hunan Provincial Museum	Fig. 3.10
City or mausoleum map found at Mawangdui	Drawn before 168 B.C.	48 × 48	Ink on silk	Hunan Provincial Museum	Fig. 3.6
Map of Ningcheng	Former Han	120 × 318	Tomb mural	Horinger County, Inner Mongolia	Fig. 6.13
Map of Fanyang	Former Han	94 × 80	Tomb mural	Horinger County, Inner Mongolia	Fig. 6.12
Manor map	Former Han	191 × 300	Tomb mural	Horinger County, Inner Mongolia	Fig. 6.16
Yu gong diyu tu, Pei Xiu	Third century	Unknown	Not extant		
Fangzhang tu, Pei Xiu	Third century	ca. 3 × 3 m	Not extant		
Map of Wutai Shan	Tenth century	4.6 × 13 m	Cave mural	Dunhuang, Gansu Province	Fig. 6.18
Shouling tu, Shen Kuo	Eleventh century	Unknown	Not extant		
Jiu yu shouling tu	1121	130 × 100	Engraved on stone tablet	Sichuan Provincial Museum	Fig. 3.12
Hua yi tu	1136	79 × 79	Engraved on stone	Shaanxi Provincial Museum	Fig. 3.13
Yu ji tu	1136	80 × 79	Engraved on stone	Shaanxi Provincial Museum	Fig. 3.14

[a]These are the pre-Ming maps most often referred to. Illustrations of all the extant maps in this appendix, as well as those of numerous other maps, appear in Cao Wanru et al., eds., *Zhongguo gudai ditu ji* (Atlas of ancient Chinese maps) (Beijing: Wenwu Chubanshe, 1990–), vol. 1, *Zhanguo-Yuan* (Warring States to the Yuan dynasty).

[b]For the location of place-names in this chapter and chapters 4–9, see fig. 3.33.

APPENDIX 3.1 (*continued*)

Name of Map, and Author (if known)[a]	Date	Dimension (cm)	Medium	Location	Figure Number in Text
Yu ji tu	1142	83 × 79	Engraved on stone	Zhenjiang Provincial Museum	Fig. 3.15
Dili tu	1247	101 × 179	Engraved on stone	Suzhou Stone Tablets Museum	Fig. 4.11 (copy)
Pingjiang tu	1229	279 × 138	Engraved on stone	Suzhou Stone Tablets Museum	Fig. 6.6
Map of Jingjiang Fu Cheng	Probably 1272	340 × 300	Engraved on cliff	Yingwu Shan, north of Guilin, Guangxi Zhuang Autonomous Region	Fig. 3.30
Yutu, Zhu Siben	1320	ca. 2.3 × 2.3 m	No longer extant		