

## Confucian Scientific Identity: Qian Daxin's (1728–1804) Ambivalence toward Western Learning and Its Adherents

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**Abstract** This essay deals with a battle that, on the surface, appeared to be a battle over scientific issues but in its deeper echelons was also a cultural battle over the very identity of eighteenth-century Confucian scholars. It reveals tensions between “ancients” and “moderns,” between Chinese Confucians, Western Jesuits, and the adherents of their scientific teachings. The works of Qian Daxin—one of the most prominent scholars of the time—serve as the axis to the story, but the implications go well beyond Qian himself. Specifically, I examine three case studies: debates over the length of the tropical year, notions of cosmology, and the value of  $\pi$ . The arguments Qian had pursued unravel an anxiety over the image and contents of Confucian identity and studies and demonstrate the tight nexus of scientific endeavors and Confucian classicism in the eyes of eighteenth-century protagonists. Furthermore, this essay explores the ways such scholars perceived the structure and nature of knowledge—scientific and otherwise—as linked to the cultural and scientific identity of the Confucians.

**Keywords** Qian Daxin · Confucianism · identity · Jesuits · Western learning

In the late 1750s, Grand Chancellor He Guozong 何國宗 (d. 1766) searched for scholars who were savvy about mathematics and astronomy. The Jesuit Michel Benoist (1715–74) prepared an explanation of the structure of the cosmos wherein the Copernican heliocentric model was introduced, and He Guozong needed someone to assist him in preparing the explanation for presentation to the Qianlong emperor (Ruan Yuan 2008, vol. 2, *juan* 41: 522). He Guozong had heard of an accomplished young (then in his late twenties) official by the name of Qian Daxin 錢大昕, who had passed his *jinsshi* exam in 1754, and whose reputation in the capital began to soar. And so, He Guozong decided to employ Qian in the project in 1758 and was reportedly gratified by

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his decision, as Qian proved knowledgeable in both traditional and Western types of learning (Qian and Qian 1997: 15).<sup>1</sup>

Qian Daxin was a native of Jiading 嘉定 county (today under Shanghai administration) and served for more than twenty years as an official. In 1775 he retired, first to mourn his father and then to spend about sixteen years presiding as the head of various prestigious academies, mostly the head of his alma mater, the Ziyang Academy 紫陽書院 in Suzhou. Arguably, Qian was the greatest scholar of his day in the eyes of many of his peers and students.<sup>2</sup>

In this article I explore Qian's thoughts about mathematics and astronomy, their relation to other fields of knowledge and to Confucian identity at large, and Qian's attitudes toward Western learning. The main theme of the article is Qian Daxin's scientific approach<sup>3</sup> and the arguments he set forth for his assertions about the length of the tropical year, cosmology, and the value of  $\pi$ . I show how cosmopolitan and parochial notions intertwine in his writings about science and try to explain the reasons why Qian thought that scientific traditions in general were important, what kind of scientific traditions mattered, and what type of knowledge could be derived from them.

I argue that the main source of tension in his writings about science arose from the nexus of Confucian identity, ancient and "modern" Chinese scientific learning, and Western learning. I further claim that Qian's views about the nature of knowledge and its relation to one's cultural and social identity had significant bearing on his scientific outlook.

## 1 Qian Daxin's Familiarity with the Sciences

In the mid-eighteenth century, there was nothing trivial about studying in depth mathematics and astronomy for most of the Confucians; He Guozong and Qian Daxin, for example, alluded to the scarcity of Confucians in these fields time and again.<sup>4</sup> Indeed, it was only a year after Qian came to Beijing, at the age of twenty-five (in 1753), that he began to learn mathematics and astronomy (Qian and Qian 1997: 12). Qian Daxin did not supply us with the initial reasons that prompted him to begin these kinds of studies; still, some significant information can be extracted from the terse description of how Qian familiarized himself with mathematics and astronomy, given in his autobiography.

<sup>1</sup> See also the Qian Daxin entry in *Xu Chouren zhuan* (Luo 1991), where Qian was said to have discussed "all of the methods, [those] of the Central Land and [those] of the West" (中西諸法) with He Guozong (*juan* 49: 29); and the entry on He Guozong (*juan* 41: 522).

<sup>2</sup> See, e.g., Ruan Yuan's 阮元 (1764–1849) praise for Qian in Qian 1997, 7:1–2.

<sup>3</sup> I use the (evidently anachronistic) term *science* (and its inflections, e.g., *scientific*) to refer mainly to astronomy and mathematics and ways of engaging with natural phenomena primarily by means of calculation, observation, and experimentation.

<sup>4</sup> See, e.g., Ruan Yuan 2008, vol. 2, *juan* 41: 522 and Qian 1989, *juan* 23: 377–78. That He Guozong and Qian Daxin lamented the rarity of scholars engaging with the sciences does not mean that there was not an increase in the popularity and status of these fields, nor does it mean that the scientific community in eighteenth-century China was negligible. See, e.g., Hu 2004.

Qian wrote that his scientific knowledge was acquired, at first, from Mei Wending's 梅文鼎 (1633–1721) writings, which became basic textbooks for learning mathematics and astronomy in the eighteenth century (Jami 1994). Mei Wending's writings, we should recall, did not merely consist of mathematical data or formulations; they also exposed Qian to other types of knowledge, for which cultures other than Confucianism claimed possession and superiority, namely, Western and Muslim scientific knowledge. Mei Wending's synthesis of these various knowledge systems in his writings, under the ethos that "Western learning originated from the Central Land [i.e., China]" (西學中源 *Xixue Zhongyuan*),<sup>5</sup> was not taken for granted by Qian: he investigated further into matters of origins, diffusion, and differentiation of astronomical and mathematical knowledge between and within these cultures.

Another related aspect of Qian's early encounter with mathematics and astronomy was his historical approach to the matter. The historical perspective was relevant both to Qian's process of obtaining knowledge (the method, the sources) and to the kind of knowledge that Qian was searching for (the contents). Mei Wending's influence in this regard was plausible, as he had also tried to unearth the ancient mathematical and astronomical Chinese texts, and Qian followed suit to an extent. The differences between Mei and Qian, however, in the attitudes to both themes—Western learning and history—are revealing, and I shall point them out when appropriate.

Two years after Qian began learning mathematics and astronomy, he published his first book, which focused on calendrical issues, and made a name for himself in this field of knowledge. This was the background to He Guozong's invitation mentioned above. Although Qian did not publish another monograph on mathematics or astronomy, he kept commenting on these subjects in various short essays, notes, commentaries, letters, and questions. He also tried to advance the cause of scientific inquiry in the various educational roles he played before and after his retirement from official duty (Qian and Qian 1997; Porter 1982). In the 1790s Qian participated in Ruan Yuan's *Chouren Zhuan* 疇人傳 (*Biographies of Mathematicians-cum-Astronomers*) project, which included remarks about and quotations from scientific writings, thus requiring mathematical and astronomical knowledge, and at the same time enhanced such knowledge (Ruan Yuan 2008, 1:4).

## 2 The Debate over the Length of the Tropical Year

In 1754, two of the greatest scholars of the eighteenth century—Dai Zhen 戴震 (1724–77) and Qian Daxin—met in Beijing. Among the issues that they discussed in that meeting, and one that Qian found particularly important to comment upon, was a debate concerning the question of who was a better astronomer: Jiang Yong 江永 (1681–1762), as Dai Zhen claimed, or Mei Wending, whom Qian Daxin endorsed. The main criteria upon which to decide the matter, according to a letter Qian sent to

<sup>5</sup> For more on the ethos and its development, see Xu 2000: 319–72; Elman 2005: 149, 154–56, 172–77, 473 n. 115; Sivin 1995b, pt. 5: 1–27; Henderson 1986, esp. 139–48; and Horg 1993a, esp. 175. For the notion that this origination ethos (or myth) prevented further interest in Western sciences (to which I do not concur), see Liu 2005.

Dai after their meeting, were the assertions of Jiang and Mei regarding the length of the year and its definition (Qian 1989, *juan* 33: 595–97).

The debate over the length of the year was no minor issue in the history of Chinese astronomy and calendrical studies. In a treatise dedicated entirely to the history of different renderings of the length of the year, the *Gujin suishi kao* 古今歲實考 (*Examination of the [Length] of the Tropical Year from Antiquity to the Present*) (Dai 1983), Dai Zhen, along with Qian Daxin (who appended notes to the book), counted no less than sixty calendars, most of which gave a different value to the length of the year.<sup>6</sup>

As in other places at different times, determining the length of the year was of crucial importance for a variety of religious, political, and other reasons (Grafton 1993, esp. 336–57; Bien 2007). During the sixteenth century Chinese scholars were well aware of the growing inaccuracy of their calendar and raised various suggestions on how to amend it (Elman 2000: 468–73). Yet it was only with the Jesuits, and with the needs of a new dynasty, that a new calendar was adopted in the early Qing. With it, a new way of calculating the length of the tropical year and a new cosmology, which influenced the various calendrical calculations, were introduced, and these carried a changing cultural baggage.<sup>7</sup>

The new calendar, and the new methods of calculating the length of the year, did not, of course, go unchallenged, and the Yang Guangxian 楊光先 (1597–1669) affair of the 1660s is perhaps the best example of such a challenge, based on sociocultural motivations.<sup>8</sup> Although it seems as if the general endorsement of the new (Jesuit-constructed) calendar by prominent scholars such as Wang Xishan 王錫闡 (1628–82) and Mei Wending had settled the issue by the late seventeenth century,<sup>9</sup> debates over the length of the year continued well into the eighteenth century. In 1741, for example, Mei Wending's grandson, Mei Juecheng 梅黻成 (1681–1763), debated the subject with Jiang Yong.<sup>10</sup> Significantly, the contenders in this debate often turned to cultural rather than purely scientific arguments, namely, the authority and legitimacy of Westerners and “ancients,” with Jiang Yong promoting Western learning, and Mei Juecheng safeguarding, in his eyes, Confucian tradition and denouncing Jiang's lack of cultural backbone.<sup>11</sup>

With Mei Juecheng's critique of Jiang Yong's book and persona, it seemed as if the fate of Jiang Yong's book, for which he wanted Mei Juecheng to write a preface—the *Yi Mei* 翼梅 (*The Wings of Mei [Wending]*)—was doomed (see also Chu 2010). Nonetheless, the book lived on in Huizhou, Anhui, where Jiang Yong was teaching,

<sup>6</sup> Sivin 1969 and 2004 recorded 98 calendars (see also Yabuuchi 1963, 1990: 388–93). The length of the year was only one of the parameters to be accounted for in the calendrical system. Thus, the parameters that affected the length of the year could, and often did, differ among different calendars. See also Cullen 2004 and Elman 2000: 468–73.

<sup>7</sup> See, e.g., Zhao et al. 1928, *juan* 26, 45 and Dai Zhen 1983: 25a; see also Sivin 1995b: 63–122 and Golvers 1993: 70.

<sup>8</sup> For the Yang Guangxian affair, see Zhu 1990, esp. 81–112, Menegon 1998, and Elman 2005: 134–44.

<sup>9</sup> The length of the tropical year determined by the Jesuits in China was not the same as the length of the tropical year according to the Gregorian (or Julian) calendar. The methods of intercalation of the calendar also differed from the Gregorian calendar so as to match the basic Chinese notions of a lunar year.

<sup>10</sup> See Jiang Yong ca. 1886–97, “Xu” (序 “Preface”) (vol. 143: 1a, 2a) and “You xu” (又序 “Additional Preface”) (vol. 143: 1a–2b), and Mei Wending 1971, 7, *juan* 56B: 28a–b. See also Chu 1995.

<sup>11</sup> See, e.g., Jiang Yong ca. 1886–97, 143: 1.36a–b, 1.38a, 1.40a–41a. See also Chu 1994: 244–83 and Huang and Hu 2004.

and where Dai Zhen was a student.<sup>12</sup> And when Dai Zhen went to Beijing in 1754, he brought the book with him and introduced it to Qian Daxin. Yet Qian Daxin was not too keen, to say the least, on Jiang Yong's teachings, and so the 1754 debate ensued. While Mei Juecheng's reasons for rejecting the *Yi Mei* may have been partly influenced by being a relative of Mei Wending, and thus a self-appointed guardian of the family tradition (with imperial endorsement), Qian Daxin bore neither family relations nor local allegiance to Mei Wending. What, then, was the rationale that led Qian to choose Mei over Jiang, and—more important, perhaps—why was the whole issue a cause for concern for both Qian Daxin and Dai Zhen?

In the letter Qian wrote to Dai after their meeting, regarding the debate over Mei Wending and Jiang Yong, Qian discussed the discrepancies between Jiang's and Mei's assertions about the length of the tropical year, among other issues, and brought arguments to support Mei Wending's stance as well as (or perhaps even more so) to discredit Jiang (Qian 1989, *juan* 33: 595–97). In the opening paragraph of the letter, Qian set the tone for the debate, presenting the question of Mei versus Jiang as an opposition between two cultural alternatives—Confucian versus Western (or perhaps the Chinese Ru, Zhong Ru 中儒, versus the Western Ru, Xi Ru 西儒): “Xuancheng [Mei Wending] was able to use Western learning, whereas master Jiang became merely a tool in the hands of Westerners” (宣城能用西學。江氏則為西人所用而已). Qian then further denigrated Jiang Yong in an extreme, uncharacteristic, fashion,<sup>13</sup> comparing Jiang to the notorious Qin dynasty prime minister Li Si (ca. 280–208 BC), accusing Jiang of falsifying history, useless sophistry, and basic incompetence. Qian presented Jiang as a traitor who betrayed the way of Xi and He, the fundamental beginning of astronomy for scholars for scholars in eighteenth-century China, and played right into the hands of the Westerners.<sup>14</sup>

At that time, however, Westerners were, allegedly, hardly a factor to reckon with for highbrow scholars: during the late Kangxi and Yongzheng reign periods, Christian proselytism ceased to be an issue for the scholarly elite due to imperial intervention (Huang 2006, esp. chap. 2), the status of Westerners dramatically declined, and Western learning was seemingly already neatly synthesized into the Chinese scientific discourse, especially through the works of Mei Wending, sponsored by the court (Chu 1994: 224–29). Furthermore, the ethos that “Western learning originated from the Central Land” had already been well established, and on the surface it seems that no further justification—if that was the main concern—was required for scholars to engage with Western learning or, alternatively, to avoid it. If that was the case, then why did Qian Daxin worry about becoming “merely a tool in the hands of Westerners”?

In the letter, Qian Daxin discussed the exemplars that were under attack by Jiang Yong: Guo Shoujing and Yang Guangxian. Guo Shoujing 郭守敬 (1231–1316) (Nha

<sup>12</sup> On questions over the relationship between Dai Zhen and Jiang Yong, see Yu 1976, Chen 2004, Yang 1995, and Lu 2003.

<sup>13</sup> Qian Daxin rarely resorted to the kind of language he used in this letter to describe Jiang Yong.

<sup>14</sup> Xi and He, according to the *Shangshu*, were sent by the legendary emperor Yao to survey the land and had responsibilities regarding determining the seasons, the calendar, and the heavenly objects, and were thus of immense importance in Confucian culture (Shangshu 2001, *juan* 2: 48–49; Chen 1996: 11–14; Cullen 2006: 3–4; Henderson 1977, esp. chaps. 1, 2; Chang 1987, esp. 7–8). For Jiang Yong's use of Xi and He, see Jiang, ca. 1886–97, “You xu” (vol. 143: 1a–2b).

and Stephenson 1997) was the great astronomer and calendrical specialist (among other trades) who was credited with the formation of the Shoushi 授時 (Season Granting) calendar, one of the most sophisticated calendars in Chinese history, and perhaps the best alternative to the Western methods of calendar making at the time. Yang Guangxian was the one who tried to uproot the Western influence at court during the 1660s, successful for a few years but vanquished at the end.

For a 1799 republication of Yang's book *Bu de yi* (不得已, *I Cannot Do Otherwise*), Qian wrote a short postscript,<sup>15</sup> wherein he supported Yang Guangxian—who was wrong about scientific issues but right, in Qian's view, in cultural matters. For Qian, science and cultural identity were bound together; knowledge of mathematics and astronomy was not unrelated to what it meant to be a Confucian, whether in the face of the West or within Confucian classical tradition.<sup>16</sup> The threat of the West perhaps ceased to be a direct political threat regarding loyalty to the emperor versus loyalty to the Pope; nevertheless, the cultural threat, understood as a threat to Confucian identity, persevered.

Qian also argued in favor of Guo Shoujing's method of calculating the length of the year—taking the length of the year as longer in the past and shorter in the future in any kind of calendrical calculations. These calculations were important for mostly two categories of knowledge: first, in order to fine-tune the calendar at times (hence contemporary religiopolitical implications, concerning, for example, the correct prediction of natural events), and historically, in order to calculate dates of past events, both human and heavenly. In this latter sense, Qian accused the Western methods of being irrelevant, since these methods had no bearing, he claimed, on the past, did not search for information in the past, and were thus not relevant for comprehending the Chinese past. The Western disregard for the past—according to Qian—also enabled the Westerners to use a mean value for the tropical year rather than an exact one. And the past, the venerated antiquity (*gu* 古) was one of the pillars of Confucian identity for Qian as for many others of his fellow Confucians (see also Liu 2006: 266–88, esp. 274).

But Qian was not satisfied in asserting that the Western methods did not accord with the needs of the Chinese; rather, he went further by discrediting Western methods in and of themselves. I emphasize that Qian not only put Western notions into Chinese terms, found or invented precedents for Western notions in ancient Chinese texts, or put aside Western notions he deemed irrelevant. He went further and made an effort to discredit, prove wrong, or accuse the West of plagiarism. Qian claimed that there was an inconsistency in the Western values of the tropical year over a short period of time—“not even a hundred years” (未及百年)—and that the Westerners had internal feuds about the subject. Furthermore, in another short essay, “The Calculation Methods of the Muslims” (回回算術), Qian Daxin went so far as to accuse Tycho Brahe of outright fraud, using Muslim values while falsely claiming to have measured them himself (Qian 1997, 7: 473–74).

<sup>15</sup> The mentioning of Dai Zhen means he contemplated the issue before 1777 (Dai Zhen's death). See “*Bu de yi* tiji” 不得已題記 (“Record of the Problem of the [Book] *I Cannot Do Otherwise*”), in Yang Guangxian 2000: 195.

<sup>16</sup> The nexus of science and classicism as a whole for premodern scholars was not unique to China; see, e.g., Anthony Grafton's discussion about Kepler (1991: 178–203).

Qian Daxin's rebuttal of one of the strongest astronomical claims of the West for exact measurements thus not only portrayed the West as fraudulent but also those who followed it uncritically as misled, at best. Qian's argument was, however, problematic; the measurements of Tycho Brahe were not only or mainly designated as the measurement of the length of the tropical year, and had many other facets, such as the movement of various stars and constellations, and a new cosmology. Qian's argument, then (whether or not he understood Tycho Brahe's project in its entirety is a different issue and hard to prove), was not about astronomy per se but rather a cultural argument against using Western methods wholesale.

The crux of the matter was not, I argue, just an external threat by Westerners who might use Confucian scholars, but also, perhaps even more so, the challenge by modernistic Confucian scholars favoring Western learning and so posing an internal threat to Confucian culture and to Confucian identity. By the middle of the eighteenth century, the Western cultural alternative had already been delivered in Qian's and others' views, and the scientific dispute was, at times, a foil for an internal cultural battle (see also [Chu 2003: 196](#)). In this battle, to have accepted Western scientific presuppositions was as fierce a blow to the tradition of Xi and He as it could get, with or without regard to the details. The threat of Christianity as a teaching (教) was therefore intertwined with its association with advanced technology and science.

### 3 Cosmology and the Nature of Knowledge: Legitimation and Invalidation of Western Astronomy

Qian Daxin's view of Western cosmology was in line with this cultural battle: he presented the cosmology as a heuristic device, which could be useful for calendrical calculations, but it was no more than a heuristic device; it was not the true shape of the heavens ([Sivin 1995a: 165–90](#)). As a heuristic device this cosmology was legitimate as long as it helped the calculations, but when scholars—such as Jiang Yong—perceived it as real or true, they contradicted the traditional way of thinking about the cosmos, and thus the threat was enhanced. We should recall that in Europe, not too long before (and even after), a similar strategy was adopted to legitimize the new heliocentric cosmology, while at the same time still adhering to the traditional Christian cosmology that located the earth at the center, and postulated real, physical, spheres on which stars and constellations were situated ([Dobrzycki 1972: 7–30, 31–56, 79–116](#)). The Christian and the Confucian motivations to solve the apparent discrepancy between ideology and astronomy were thus not dissimilar, and the solutions—in the form of a bifurcation into the real and the heuristic, which legitimized the mathematical and astronomical endeavors—were also not far apart ([Henderson 1986: 129–31, 144–45](#)).

Could one know the real heavens? Qian's quote in the letter to Dai Zhen from the *Zhouyi* 周易 (*The Changes of Zhou*) that “going beyond this, it is hardly possible to know” (過此以往,未之或知) ([Zhouyi 2001, juan 8: 626](#)) revealed a tendency to limit the possible knowledge of the heavens that men could attain.<sup>17</sup> Two and a half decades

<sup>17</sup> Note the similarity to skepticism on man's capability to know the heavens in Europe. See, e.g., Brahe's

after the letter, Qian repeated the difficulty of knowing heaven and earth and maintained that although “only through numbers there is a way of knowing them” (唯數有以知之), that knowledge was still partial (Qian 1989, *juan* 23: 377).

Yet while the possibility of knowledge was limited, there were those who already had the knowledge that could be obtained, the men of antiquity (古) (ibid.). The notion that the ancients had already mastered all possible knowledge of the cosmos is also apparent in Qian’s letter; the progress that could be made was thus toward understanding the ancients better. In other places in Qian’s writings this notion of the superiority of the ancients reappeared at times, and this notion was related to Qian’s quest for the origins from which later scientific assertions had developed, origins that for him—as I shall soon demonstrate—were the better originals. In the discussion on the length of the tropical year, Qian mentioned that the Western value was based upon the old value of the Muslims. Dai Zhen, in his monograph about the history of the length of the year, also asserted that the Western value originated from the Muslims and further claimed that the old value that the Westerners had for the length of the year (that is, that of the Julian calendar, 365.25 days) was based on the ancient Han dynasty *sifen* (四分, one-quarter) calendar (Dai 1983: 25b).<sup>18</sup>

Qian, nonetheless, also legitimized Western science through his quest for origins. In a “Questions and Answers” section (Qian 1989, *juan* 14: 229–30), Qian posed a question regarding the origins of the Western theory of the sun’s apogee and perigee. His answer allows us to consider how he understood this theory, how he thought about knowledge, and how he perceived the relation between Confucian and scientific knowledge in his own time. He began by claiming that while the origin of this Western theory was Muslim, as he researched further into the subject he found a precedent to this line of thinking in the theory of the “four movements” (四遊, *si you*), described in the *Shangshu wei* (尚書緯, *The Woof of the Documents*) and its commentary.<sup>19</sup>

Qian then explained the “four movements” theory and practically equated the two—the Western apogee and perigee and the ancient Chinese “four movements”—saying that “although the theories of the two lineages [China and the West] seem to be incompatible, in fact they prove each other, just as the two halves of a tally” (兩家之言似柄鑿之不相入, 而還以相證, 如合符節). Qian’s illustration of the similarity of the two methods—“two halves of a tally”—is of importance. This illustration is a quote from the *Mengzi*, 8:1 (Lau 1970: 128); there, it describes the similarity in the actions of the sage emperor Shun (who was described as a native of the east) and King Wen (a native of the west). Although *Mengzi* claimed Shun was much earlier than King Wen, the guiding principles of the two were similar, and so were their achievements within “the Central Land” (中國). Thus, Qian Daxin established the Chinese method as similar, yet prior, to that of the West, and this at the same time legitimated the Western method by making it a derivative.

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remark that “we have no real knowledge of the matter or nature of the whole heavens, sun and moon, nor what causes their wonderfully adroit motion, though they have stood and been visible since the beginning of the world” (qtd. in Mosley 2007: 72).

<sup>18</sup> Note that there was no enmity toward or sense of threat from Muslim science.

<sup>19</sup> This book is a lost apocrypha of the first century BC, preserved mostly through the commentary of Zheng Xuan 鄭玄 (127–200). See also Needham 1959: 224.



Toward the end of this section, Qian lamented the fact that the *Shangshu wei* was lost and explained that the “later Confucians” (後儒)—a vague term he often used without naming names—had slandered the theory as “hard to believe” (難信). Qian thus concluded that “those who practice Western learning” (習西學者) lacked knowledge of their own tradition and so failed to “connect the positions of antiquity and the present time” (通古今之郵). Thus, we are introduced to another facet of Qian’s engagement with the sciences (and other fields of knowledge): his notion of an ongoing “ancients versus moderns” debate. Although the notion of a discord between “ancient” (古) and “modern” (今) times was not an eighteenth-century novelty (see, e.g., Kuhn and Stahl 2008), the challenge in the discord that Qian discussed also involved a new group, namely, Westerners. And, as we have seen, Qian both legitimated Western knowledge and attacked it, trying to overshadow its accomplishments, and exposed what he considered to be its faults.

Scientific knowledge cannot be taken as a unique category, unrelated to, for example, knowledge of human nature, rituals, or morality. What was at stake in the scientific knowledge debate between China and the West, as well as between ancient and modern Chinese knowledge, was thus the cultural identity of Qian Daxin and the Confucians at large. The scientific identity of the Confucians—no less than a cultural commitment—was on a collision course, at times, with the West and those perceived as Confucian modernists who upheld Western thought.

Qian Daxin clearly recognized the superiority, in general, of the Western scientific methods over those attained by China during the past few centuries before his time, as his letters to Dai Zhen and Tan Tai (談泰), Qian’s student and a *jurem* degree holder of 1786, suggest. That the Chinese methods were inferior to the West, according to Qian, was not due to the marvelous novel achievements of the West but rather to the incompetence of the Confucians—Ming Confucians in particular—in engaging and transmitting ancient Chinese scientific knowledge (Qian 1997, 7:385). By so doing, the Confucians had lost an important and integral part of their identity as Confucians, as Qian wrote in his letter to Tan Tai: “Since antiquity there had been no one who did not know numerical [methods] and was regarded as a Confucian. The disadvantage of Our methods with regard to Europe stem from the mathematical ignorance of the Confucians” (自古未有不知數而為儒者。中法之絀於歐邏巴也, 由於儒者之不知數也) (Qian 1989, *juan* 23: 377). The fault of the Confucians was thus twofold: on the one hand, they did not manifest the ancient ideal, while on the other, they were responsible for China’s inferiority in this subject, and so their cultural identity and their favorable official status were at risk.<sup>20</sup>

In the same letter to Tan, Qian lamented that mathematical studies were discontinued after Dai Zhen’s death. Qian, however, was not entirely pessimistic: scholars such as Dai Zhen and Tan Tai gave hope of revitalizing China’s stance on the matter. “Originally,” wrote Qian, “the ancient methods and [those of] Europe were not so far apart from each other” (古法與歐邏巴原不相遠) and thus the revival of mathematics was at hand. It seems that the statement would suggest that the methods of the Chinese

<sup>20</sup> The Yang Guangxian affair would be a good example for the struggles at court, especially around the Imperial Astronomical Bureau, involving Confucians, Muslims, and Jesuits competing on official posts and influence. See Elman 2005: 134–49.

and the Europeans were “close” because they came from a common—ancient Chinese—source.

Furthermore, if one assumed that Western methods originated in China, then the new, rigorous, philological and historical methodology, in which Qian was fluent, could reconstruct the ancient texts and enable the ancient, original, Chinese sciences to bloom. In order to catch up with the mathematical advancement of the West, China, according to Qian, had to go back to antiquity. How far back would be a different question, with different answers depending on the subject of inquiry. It should also be noted that Qian had both the students and the institutional means to try to advance the cause of the sciences, and indeed, some of his students and relatives later became renowned mathematicians.

#### 4 Why $\pi$ ? Why Science?

Examples of two of Qian’s followers can be found in his short, undated essay regarding the value of  $\pi$ : “Yuan jingzhou lu” 圓經[徑]周率 (“The Ratio of the Diameter and Circumference of the Circle [ $\pi$ ]”).<sup>21</sup> He began the essay with a quotation from the *Sui shu* 隋書 (*Records of the Sui Dynasty*), which ended with Zu Chongzhi’s 祖沖之 (ca. 429–500) value of between 3.1415926 and 3.1415927 (Wei et al. 1973, *juan* 16: 387–88). Then, Qian proceeded to claim that based on trigonometric methods the Westerners arrived at a value that was exactly in the middle of Zu Chongzhi’s range, 3.14159265, and that most methods thus far were in basic agreement with this approximate value. Lastly, Qian insisted that almost everyone thus far was wrong, and the correct value of  $\pi$  was in fact 3.16. Qian’s reasons for supporting the value of  $\pi$  as 3.16 included:

- Experimentation: taking a large round wooden wheel with the diameter of 1 *zhang* and actually measuring the circumference by using a long elastic bamboo strip.
- Theoretical argument: using triangles made of straight lines to measure a curved line was categorically wrong, and ended up with an inaccuracy.
- Historical argument: Qin Jiushao 秦九韶 (ca. 1202–61), in order to calculate the area of a circular field, had arrived at a value of  $\pi$  as the square root of 10, which, if calculated, according to Qian, is 3.16227766. “Therefore,” Qian concluded his essay, “the ancients had already realized it before” (則古人已有先覺者).<sup>22</sup>
- Ad hominem argument: this brings us back to his relatives and students—his nephew, Qian Tang (錢塘, 1735–90), had written on the subject, and his student Li Rui (李銳, 1765–1814) continued this line of thought (hence Qian’s motivation for writing the essay).

In his discussion of the value of  $\pi$ , Qian Daxin refuted both the “modernists,” or “later Confucians” 後儒 (hou Ru), and the Westerners or those adhering to their teachings. Surprisingly, perhaps, Qian’s support of 3.16 as the value of  $\pi$  also put

<sup>21</sup> Since Qian mentioned Li Rui in the essay (Qian 1997, 7: 463–64), it had to be written during or after the 1780s. For more on the history of the value of  $\pi$  in Chinese history, see Qian 1983: 50–74.

<sup>22</sup> For Qin Jiushao, see Libbrecht 1973, esp. 96–97, 275–76.

him in a collision course with Mei Wending, whom he supported earlier but who accepted the value of 3.14. Qian had a different agenda, however, than Mei's: while Mei was intent on finding the common denominators with Western teachings and looking for ancient Chinese antecedents for them, Qian was also searching for dissimilarities, trying to show how, on the one hand, the Westerners got it wrong and, on the other hand, how ancient Chinese got it right. Qian manipulated the term "ancient" (and "later Confucians") so as to fit his needs. Rather than abide by a strict chronological sequence to determine "antiquity," he used a cultural standard, relevant within the context of the cultural debate and its official repercussions mentioned above.

The debate, in which Qian was taking part, was thus both a China-versus-West debate and an internal Confucian debate that used the West, for which there was no Westerner to speak on its behalf (such as Ferdinand Verbiest [1623–88] a century earlier), preferably in Chinese. Benoist, who presumably could have done it, only presented the emperor with a gift—a map of the cosmos and its explanations—and did not have the opportunity to counter claims made by Qian and others or to better explain his position. Benoist had more pressing duties, such as fixing European gardens to the liking of the Qianlong emperor, and it is doubtful whether Qian would have even been willing to hear Benoist's explanations (Elman 2005: 209–11; Sivin 1995b: 63–122).

But why did Qian bother with science in the first place? What did the scientific fields of knowledge mean to him? In Qian's 1780 preface to Qian Tang's work—*Huainan Tianwen xun buzhu* 淮南天文訓補注 (*Further Commentaries on the Heavenly Patterns Teaching [Chapter] of the Huainan[zi]*) (Qian 1989, *juan* 25: 419–20)—he explicitly asserted that Confucius began the astronomical endeavor in his exegesis on the *Changes* and claimed that "the heavenly patterns are the Way of Heaven" (天文即天道也) (Qian 1989, *juan* 25: 419–20).<sup>23</sup> The Way of Heaven, he wrote, had always been discussed in astronomical and astrological terms.

Although there was nothing new about Qian Daxin citing the *Zhouyi* and equating the Way of Heaven with the heavenly patterns, it sheds light both on the impetus to deal with scientific subjects and on the importance of astronomy and mathematics for what we call astrology and divination. As Qian continued in his preface, elucidating the merits of Qian Tang's book, this issue became even clearer. Cosmology, divination, and astronomy were all presented there as part of a larger topic of inquiry, which was also related to classicism through the *Yijing* (see also Ng 1998). The categories of number-related fields of knowledge in eighteenth-century China were not neatly organized into clearly defined and separate fields as the terms "mathematics"/"numerology" and "astronomy"/"astrology" may suggest (see also Standaert 2000).

As in early modern Europe, where mathematics was a broad category that began to be more narrowly and precisely defined only in the nineteenth century, Qian Daxin's categorization was also broad, and the terms he used were interchangeable rather than rigid or specific. In different essays, sometimes even in a single essay, he used different terms to indicate similar referents. These terms included *computational methods* (算術),<sup>24</sup> *calculations* (步算),<sup>25</sup> *arranged calculations* (布算),<sup>26</sup> *calculation studies*

<sup>23</sup> Qian quoted *Zhouyi* (2001, *juan* 7: 550, *juan* 8: 655).

<sup>24</sup> Qian 1989, *juan* 14: 230–31, *juan* 17: 279; 1997, 7:385, 466, 8:3.

<sup>25</sup> Qian 1989, *juan* 23: 377, *juan* 39: 706.

<sup>26</sup> Qian 1997, 7:385, 466.

(算學),<sup>27</sup> *heavenly patterns* (天文),<sup>28</sup> *predictive [heavenly] paces* (推步),<sup>29</sup> *calendrical arts* (曆術),<sup>30</sup> *numerical arts* (術數),<sup>31</sup> or simply *numbers* or *studies of numbers* (數, 數之學).<sup>32</sup> Those who engaged in these fields were often labeled either *chouren* (疇人, or 疇人子弟, the next generations of the *chouren*) or by adding the suffix *jia* (家) to one of the above terms. The *chouren*, in Qian's writings, could deal with any of the numerical categories mentioned above, not restricted to mathematics, astronomy, or calendar but also including divination methods.

Qian's lack of clarity over the matter was not unique; the *Siku quanshu* categorization was no more unequivocal than his, even though they seemed to be trying to rethink the old categories and terms and formulate them in a somewhat new way. There, under the (new) bibliographic category of *tianwen suanfa* (天文算法 *astronomy and mathematics*), both astronomical texts and mathematical texts were included within two different subcategories: Predictive [Heavenly] Paces (推步) and Calculation Books (算書). The editors of the *Siku quanshu* were well aware of the interconnectedness of these categories, mentioning that “computational methods and heavenly patterns complement each other” (算術天文相為表裏) (Ji et al. 1983, 3:278–303), yet they tried to distinguish between them. The books listed under the two subcategories—roughly corresponding to a distinction between astronomy and mathematics—were nevertheless not exclusively related only or mainly to one of the categories. The preoccupation of the editors with these categories was part of a larger theme of rethinking about knowledge (not just related to scientific issues) and its categorization during the late eighteenth century (see also Elman 2005: 265).

The above categories, however, were not the only ones that involved numbers, or that were conceived of in terms of astronomy and mathematics. Another, related, category was that of numerology—*Shushu* 術數 (arts of numbers)—which the *Siku quanshu* editors put right after the astronomical and mathematical category (perhaps thereby prioritizing the latter two) and which, although clearly understood to be separate from astronomy and mathematics, was also taken as linked to them. This category consisted of books dealing mostly with divination.

The three categories were thus interconnected: many divination methods used both astronomy and mathematics, and in some cases the urge to search for astronomical or mathematical answers came from divinatory needs. Indeed, some of Qian Daxin's essays about divination (Qian 1997, 7:57)<sup>33</sup>—even if Qian's focus was academic and historical rather than that of a practitioner—demonstrate the nexus of exact astronomical, mathematical, and calendrical data and divinatory methods and also testify to his historical approach to scientific issues (see, e.g., Qian 1997, 7:387–88). The impetus for obtaining such technical knowledge, then, was part of what Confucian culture and the *Classics* (especially the *Yijing*) were all about.

<sup>27</sup> Qian 1989, *juan* 39: 711.

<sup>28</sup> Qian 1989, *juan* 4: 53.

<sup>29</sup> Qian 1989, *juan* 14: 214, *juan* 33: 595, *juan* 39: 710, 711; 1997, 7:385, 386.

<sup>30</sup> Qian 1997, 8:3.

<sup>31</sup> Qian 1997, 7:386.

<sup>32</sup> Qian 1989, *juan* 23: 377–78, *juan* 33: 597.

<sup>33</sup> See also the tight nexus of astronomy-calendar-divination in Cao Mo 1986, esp. 16–30.

## 5 Conclusion: Qian Daxin's Stance vis-à-vis the History of Western Learning in China, 1600–1800

We do not have Dai Zhen's reply to Qian's long letter. We do have the biographies of Jiang Yong that each of them—Dai and Qian—wrote after Jiang's death in 1762. The two biographies<sup>34</sup> regarded Jiang as a foremost scholar, an exemplary Confucian, who was fluent in ancient learning. Both quoted Jiang's critique of Mei Wending's notion of the tropical year; neither—in a manner fitting the genre of biographical writings commemorating a deceased—offered his own judgment on whether Jiang was right or wrong. Jiang was thus legitimized after his death by the two outstanding scholars, without looking further into the matter. In the 1754 debate between Qian and Dai, Qian had the last word (see also [Chu 1994: 244–46](#)).

Both Qian and Dai were not part of the Astronomical Bureau, and their opinions did not influence the imperial calendar one way or the other; they also did not try to appeal to the emperor to change the calendar according to their understanding of it. Thus, it seems that the debate was, at least in part, a foil for a different battle, which was cultural,<sup>35</sup> mostly textual, and limited to the community of high-brow Confucian scholars (as opposed to technicians, official astronomers, or Western scholars). The debate was a battle about legitimate knowledge as the basis for cultural, official, and political identity and status, ranging over a battlefield of texts, both ancient and new. The rivals were the ancients and moderns, those adhering to earlier Chinese texts, and those accepting the validity of Western texts and scholars. The very nature of knowledge, what can be known and by what means, was disputed, as was antiquity's authority. And the identity of those trying to secure the knowledge, the Confucians, was threatened by the superiority of the Western sciences, a superiority that Qian Daxin and others had admitted.<sup>36</sup>

The nexus of science and cultural identity was, and is, not a unique Chinese phenomenon. For the Jesuits, this nexus manifested in the link they established between natural philosophy and theology, yet for Qian Daxin, as for other Confucians, the nexus of Confucian culture, classicism, identity, and the sciences was just as strong and just as influencing (see also [Wang 2007](#)). That is why the Jesuit claims for scientific superiority could mean superiority in other fields of knowledge for both the Jesuits and the Confucians.

The Confucian encounter with Western learning had been fraught with cultural, religious, and institutional implications from its inception. One of the prominent supporters of Western learning in the late Ming, Xu Guangqi 徐光啓 (1562–1633), while using the rhetoric of the greatness of the ancient sages, propounded the view that knowledge was progressive and accumulative. Xu not only thought of knowledge as progressive but was even willing to concede to the West superior knowledge, as a number of memorials to the throne demonstrate. In one of these memorials (dated 1629), for example, Xu wrote explicitly that “all of these [astronomical issues] were

<sup>34</sup> Dai's was written in 1762 ([Dai Zhen 1995, 6:409–14](#)); Qian's is undated ([Qian 1989, juan 39: 705–9](#)).

<sup>35</sup> The debate also had an implication over the question of who could take office.

<sup>36</sup> Another aspect, on which I did not touch in this article, was the Manchu, Mongol, and Tibetan interests in astronomy, mathematics, calendar, and divination. See, e.g., [Chen Jiujin 1996: 408–36](#).

unheard of since antiquity, only the calendar of the Western countries has had them” (皆古來所未聞，惟西國之曆有之) (Xu 1963, 2:327).

Nonetheless, the notion that Western knowledge *in tutto* was never part of the indigenous traditions of China was, by and large, rejected, and Western knowledge was domesticated through the rhetoric of “when the rites are lost seek out in the open [i.e., outside of the civilized center]” (禮失求野) or later “Xixue Zhongyuan” (Western learning from the Central Land) during the seventeenth and early eighteenth centuries.<sup>37</sup> Still, as Hashimoto Keizo and Catherine Jami (2001: 274–78) successfully demonstrated, Xu’s notion of scientific progress was not unique, and those who later rejected some of Xu’s conclusions—Wang Xishan 王錫闡 (1628–82), for example—consented to the notion of scientific progress. Hashimoto and Jami also succinctly showed that Mei Wending himself agreed to this notion of progress.

Nonetheless, the agendas of Xu Guangqi, Mei Wending, and Qian Daxin were not the same. For Xu Guangqi, as for his Jesuit interlocutors, the scientific aspects of Western learning were intertwined with the cultural-religious aspects of Western learning, namely, Christianity (see, e.g., Peterson 1988; Standaert 2001). In a way, the great project of Mei Wending and others, who did not accept the cultural-religious superiority of the West, was to untangle Western (scientific) learning from Western (cultural-religious) learning. Thus, while both Xu and Mei engaged in a synthesis of Western and Chinese learning, each of them had a very different view of the synthesis, since the synthesis for both meant cultural hierarchy: Western over Chinese for Xu or vice versa for Mei.

Mei Wending, however, was not as decided about how to achieve his hierarchical synthesis as one might think. One section by Mei—“Lun Xili yuanliu ben chu Zhongtu ji Zhoubi zhi xue” 論西歷源流本出中土即周髀之學 (“Discussion of the Origin and Spread of the Western Calendar Which Originated in Our Land and Comes Close to the Teaching of the *Zhou Gnomon*,” written a few years after Mei met with the Kangxi Emperor in 1705)—demonstrates his anxieties well. In it, Mei accepted the progressive nature of scientific knowledge, describing a gradual improvement in the history of calendars, from the Han onward, and included the “Western methods” (西術) as the culmination of this improvement. He also implied that science is of a universal, border-crossing type of knowledge, so “why choose between Ours or the Westerners’ [learning]?” (何擇乎中西). Immediately afterward, Mei explained that as he consulted the ancient *Zhoubi suanjing* he found that the Western teachings were all there, at a time when “there was no one who talked about Western systems” (其時未有言西法者), so “how could one negate that the ancients had [already had] their [the Westerners’] system?!” (豈非舊有其法歟). Moreover, since “their [the Westerners’] explanations were also not without a source” (其說亦非無本), and the source was identified by Mei as the *Zhoubi suanjing* (in this case), then the now domesticated Western learning could be “trusted” (信). Mei thus concluded, “Is this not the spirit of what the ancient sages had created?!” (豈非古聖人制作之精神) (*Lixue yiwen bu* 1936, *juan* 1: 1).

The tensions that the above section reveals—between progressive and static nature of knowledge, universal and parochial notions of knowledge, acceptance and rejection

<sup>37</sup> For more on the “li shi qiu ye,” see Han 2007. See also Han 2001: 363–64.

of Western scientific prowess, and the Gordian Knot of science and classicism versus a possibility of “pure,” universal science—were all part of Mei Wending’s synthesis. And while the “Xixue Zhongyuan” ethos may seem on the surface to solve these issues, one finds that these tensions did not disappear. It is therefore also not surprising that Mei tried to prove the ethos by going to the ancient texts and finding the Chinese precedents there. However, since his main motivation sprang more from scientific pursuits than from classicism, the end result emphasized the optimistic possibility for domesticating Western learning and not the clash between two competing cultures.<sup>38</sup>

Another aspect springs from the inclination of Cheng-Zhu learning (often referred to as Neo-Confucianism) to accept the progressive nature of knowledge as a whole and to grant the possibility of the moderns to know more, or at the very least differently, than the ancients (see, e.g., Bol 2008, esp. 230–35). As such, to also accept the progressive nature of scientific knowledge was part of a larger view of knowledge, on the one hand, while the resort to antiquity served more as a parochial defense of the Chinese Confucians than a view of the nature of knowledge *per se*.

But Qian Daxin did not accept the progressive view of knowledge, neither that of Cheng-Zhu learning nor that of scientific knowledge, and so he did not submit to Western subsequent superiority. Thus, Qian sought—along with other scholars of the “Qian-Jia” 乾嘉 period (1736–1820)—the superiority of Chinese science with the ancients, who were superior to the “moderns” in his view, even if “antiquity” had to be stretched all the way to the Song or Yuan dynasties to prove a point. For Qian, scientific texts and classical texts were tied together, part of one tradition, and anchored in one locus, the basis and authority of Confucian identity.<sup>39</sup> And to untangle the knot between classicism and science meant to wrong both. When Qian Daxin tried to pull the carpet from under the superiority and advancement of Western learning, he was in effect refuting the progressive nature of knowledge, be it Jesuit (scientific), synthesized (scientific), or classical/moral (Cheng-Zhu style) knowledge. In doing so, Qian also restricted and contained Mei Wending’s synthesis, as well as implicitly attacked Cheng-Zhu views of knowledge.

Lastly, during the eighteenth century there were also scholars who accepted and prioritized Western (scientific) learning, against whom Qian Daxin plausibly argued. Apart from Jiang Yong, during the late 1740s and 1750s, for example, Sheng Bai’er 盛百二 (1756 *juren*) argued in favor of the Tyconic system (Needham 1959: 456; Elman 2005: 273–74) and was later criticized by the *Chouren Zhuan* compilers (Qian Daxin or his students, perhaps) as following Western learning (Ruan Yuan 2008, vol. 1, *juan* 42: 489–90). Ming Antu 明安圖 (d. 1765?), who studied and expanded on Pierre Jartoux’s (1668–1720) work on infinite series, argued that “nothing like it [Jartoux’s work] exists in ancient or modern mathematics” (Martzloff 1997: 358). Later, and into the 1770s, Ming’s students, such as Chen Jixin 陳際新 and Zhang

<sup>38</sup> For the Kangxi Emperor’s interests and motivations, which differed from Mei’s and had a political bearing on his rule and on his ability to maneuver between the Jesuits and the Chinese Confucians at court, see Elman 2005: 154–66.

<sup>39</sup> After the Taiping Rebellion, Chinese mathematicians, who benefited from the rise in the status of mathematics due to the efforts of Qian-Jia scholars, began turning their backs to the integrated view of knowledge discussed above, and differentiated mathematics from Confucian identity.

Gong 張肱, furthered Ming's work, and maintained its circulation well into the nineteenth century (Martzloff 1997: 358; Elman 2005: 152).

Moreover, although the Jesuits were at a disadvantage by the mid-eighteenth century, their proselytizing mission remained despite it being officially prohibited, and their scientific/technological efforts were not invisible to the Confucians: be it in architecture and garden design, warfare and cartography, or painting and music, the Jesuits were still there to compete over the court's favor (see, e.g., Elman 2003). Seen in this light, the presentation of Benoist's account of the cosmos around 1760 had more than simply scientific implications, and so did the Confucian rejection thereof. And, even after the concrete threat had ended as the Jesuit order was dispersed in Europe in the late eighteenth century, the cultural threat remained, echoing in material evidence, such as the Yuanming Yuan (Chayet 2004, esp. 46).

Nevertheless, at least until the mid-nineteenth century, when a new threat was brewing, Qian, along with his peers and students, gained the upper hand: they managed to show that the threat could be overcome or contained by the most powerful weapon of all—sustained philological inquiry. This weapon, they believed, allowed them access to the original sources of knowledge, and thus to reasserting China's, or rather the Confucians', scientific and cultural superiority. With the institutional means at their disposal, Qian Daxin, Ruan Yuan, and others set to accomplish this aim, and by the beginning of the nineteenth century their students, Li Rui and Jiao Xun, for example, made significant progress in this direction.

Their views, however, were also questioned. During the late 1810s and more so the 1820s, other scholars, motivated by a sense of crisis that the philological turn had brought about, would start challenging Qian Daxin's line of thinking, openly suggesting, for example, that he was wrong about the value of  $\pi$ . Although Li Rui could accept his teacher's explanation of why  $\pi$  equals 3.16 without further critique,<sup>40</sup> Dong Youcheng (董祐誠, 1791–1823) and other scholars of his generation did not accept it and exposed the error.<sup>41</sup> These scholars, however, were part of a new debate over the intellectual heritage of Qianlong-era scholarship, a debate that continued well into the modern period.

In a preface to Qian Daxin's *Qianyan tang ji* (1989: 1), Duan Yucai wrote in 1806 that with regard to “our and Western calendrical methods from the Han to modern times, there was none that he [Qian Daxin] was not clear about as if it was a stroke of finger on his palm” (自漢迄今中西曆法無不瞭如指掌). Intentionally or not, Duan's praise for Qian implicitly exposed the main tensions in Qian's thought about scientific issues and Confucian identity: tensions between ancients and moderns, China and the West, and the interaction of all four. These tensions would go on to influence the reception of modern European science, championed by the Protestants, throughout nineteenth-century China.

<sup>40</sup> See Li Rui's entry on Qian Tang in the *Chouren Zhuan* (Ruan Yuan 2008, vol. 1, *juan* 42: 490–91).

<sup>41</sup> See more in Hornig 1991, 1993a, and 1993b.



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