



HAL
open science

Heavenly Patterns

Daniel Patrick Morgan

► **To cite this version:**

Daniel Patrick Morgan. Heavenly Patterns. Monographs in Tang Official Historiography: Perspectives from the Technical Treatises of the History of Sui (Sui shu), 2019. halshs-01404116

HAL Id: halshs-01404116

<https://shs.hal.science/halshs-01404116>

Submitted on 28 Nov 2016

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



Distributed under a Creative Commons Attribution - NonCommercial - NoDerivatives 4.0 International License

Heavenly Patterns

Daniel Patrick Morgan*

“Heavenly patterns” (*tianwen* 天文), as distinct from “sequencing” (*li* 曆), is the branch of the astral sciences that takes place outdoors—that devoted to the sky (vs. data), to anomaly (vs. regularity), and to interpretation (vs. predictive modeling). This, at least, is how it began. Things were different by the seventh century, when Li Chunfeng 李淳風 (602–670) joined the *Book of Jin* and *History of the Five Dynasties* monograph projects. What began as a diffuse corpus of pseudepigrapha dedicated to *zhan* 占 “omen-reading” had since changed at the hands (and in service) of the *li* man: its focus was shifting from unaided omen-watching (*hou* 候) to instrument-based measurement (*ce* 測); measurement brought sphere-cosmology and mathematics into observational practice; and with that came the epistemic and authorial culture of *li*. These changes, in turn, end up reflected in “Tianwen zhi” 天文志 historiography by the time of Shen Yue’s 沈約 (441–513) *Book of Song*. The early monographs were comprised of three sections: an introduction; an annals of dated phenomena as observed, “read” (*zhan*), and “verified” (*yan* 驗) in “responding” (*ying* 應) political events; and, optionally, prior to the annals, a catalog of heavenly bodies and *zhan* omen-formulae. By the *Book of Song*, the genre was expanded to include a fourth, opening section on cosmology and instrumentation (see Table 1). This section stands out as different, being as it is dedicated to questions of “testing” (*kao* 考, etc.), “tightness” (*mi* 密), and the history and priority of discovery.

The heavenly patterns monographs are invaluable sources for the history of astronomy in China, but modern scholars do not write *about* the “Tianwen zhi” so much as they write *through* it. The “Tianwen zhi” is a patchwork of parts which exhibit stronger connections vertically, across standard histories, than they do hori-

* The research leading to these results has received funding from the European Research Council under the European Union's Seventh Framework Programme (FP7/2007–2013) / ERC Grant agreement n. 269804.

¹ I use the term “cosmology” as a stand-in for the actor’s categories *tianti* 天體 “heaven’s form” and *tianlun* 天論 “discourses on heaven” as per pre-1980s sinological usages, referring to the study of the size, shape, disposition, movements, mechanics, metaphysics, and optics of heaven, earth, and the world ocean. Following Christopher Cullen, post-1980s sinology has relabeled *tianti/tianlun* “cosmography,” reserving “cosmology” for yin-yang, five-agents correlative thought; see Cullen, “Cosmographical Discussions”; Cullen, *Astronomy and Mathematics*, xi n2. Typically presented in terms of J.G. Frazer’s laws of “sympathetic magic,” my objection to the equation of correlative thought with “Chinese cosmology” is that it bans *the cosmos* from “cosmology” so as to perpetuate nineteenth-century anthropologists’ characterizations of primitive/non-Western man as being incapable of the sort of critical “observation” (*guan* 觀), “calculation” (*suan* 算), and “reasoning” (*li* 理) that one sees *alongside* yin-yang and five-agents arguments in *tianti/tianlun*; see Morgan, “A Sphere unto Itself”; Morgan, *Astral Sciences*, ch. 6, “What the Ancients Had Yet to Learn.” On “tightness” (*mi*), see Chapter 3. On the evolution of early imperial *tianwen*, see Morgan, *Astral Sciences*, ch. 3, “Observing the Signs.”

zontally, across the headings of the same monograph. The result is that scholars tend to read *across* monographs, treating each column of Table 1 as a seamless pool of information. Reading vertically has led to fruitful studies in the history of cosmology,² astronomical instrumentation,³ star surveys,⁴ omen literature,⁵ omen *practice*,⁶ the authenticity of the observational record,⁷ and the exploitation of ancient records to modern ends.⁸ We do draw horizontal lines through Table 1 in *translating*, as do Édouard Chavannes and David Pankenier for the *Shiji* “Tianguan shu” 天官書, and Ho Peng Yoke 何丙郁 for Li Chunfeng’s monograph in the *Book of Jin*.⁹ That said, for everything that rests on these sources, we have very little by way of second-order research on the compilation of individual “Tianwen zhi” beyond B. J. Mansvelt Beck’s study of the monographs of the Han 漢 (206 BCE – 220 CE).¹⁰

Mansvelt Beck’s approach to the “Tianwen zhi” genre is through the *Book of Later Han*, whose monograph is composed solely of an introduction and annals. His main problem is how to navigate compositional layers, because this and the *Book of Han* monograph are *cumulative*. As to the *Book of Later Han*, Cai Yong 蔡邕 (133–192) submitted a monograph to the throne in 178; “Qiao Zhou (199–270) picked up & continued its later [contents]” 譙周接繼其下者; Sima Biao 司馬彪 (c. 240 – c. 306) integrated it into his collection of Eastern Han monographs; and, finally, Fan Ye 范曄 (398–446) added *that* to the *Book of Later Han*.¹¹ As to the *Book of Han*, Ban Gu 班固 (32–92) “died before finishing the eight tables and heavenly patterns monograph” 其八表及天文志未及竟而卒; his sister, Ban Zhao 班昭 (44/49–118/121), was ordered to “resume and bring to completion” 踵而成之 by 105; and Ma Xu 馬續 (fl. 111–141) was ordered to “take over from [Ban] Zhao to complete it” 續繼昭成之 *circa* 110, when “the *Book of*

² Chen Meidong, *Zhongguo gudai tianwenxue sixiang*, 128–532; Cullen, “Cosmographical Discussions”; Cullen, *Astronomy and Mathematics*, 35–66.

³ Maspero, “Instruments astronomiques”; Hua Tongxu, *Zhongguo louke*; Pan Nai, *Zhongguo gu tianwen yiqi shi*; Wu Shouxian and Quan Hejun, *Zhongguo gudai tianti celiangxue ji tianwen yiqi*.

⁴ Pan Nai, *Zhongguo hengxing guance shi*; Sun Xiaochun and Kistemaker, *The Chinese Sky during the Han*.

⁵ Jiang Xiaoyuan, *Xingzhanxue yu chuantong wenhua*; Jiang Xiaoyuan, *Zhongguo xingzhanxue leixing fenxi*; Lu Yang, *Zhongguo gudai xingzhanxue*.

⁶ See, in chronological order, Bielenstein, “An Interpretation of the Portents in the *Ts’ien-Han-Shu*”; Franke, “Some Remarks on the Interpretation of Chinese Dynastic Histories”; Eberhard, “The Political Function of Astronomy and Astronomers in Han China”; De Crespigny, *Portents of Protest*; Bielenstein and Sivin, “Further Comments on the Use of Statistics in the Study of Han Dynasty Portents”; Bielenstein, “Han Portents and Prognostications”; Kern, “Religious Anxiety.”

⁷ Huang Yi-long, *Shehui tianwenxue shi shi jiang*, 1–71; see also the studies listed in Note 6.

⁸ Stephenson, *Historical Eclipses*; Zhuang Weifeng, *Zhongguo gudai tianxiang jilu de yanjiu yu yingyong*.

⁹ Chavannes, *Mémoires historiques*, vol. 3, vols. 3, 339–412; Pankenier, *Astronomy and Cosmology*, 444–511; Ho Peng Yoke, *The Astronomical Chapters of the Chin Shu*.

¹⁰ Mansvelt Beck, *The Treatises of Later Han*.

¹¹ *Hou Han shu*, zhi 10, 3215 (commentary); cf. Mansvelt Beck, *The Treatises of Later Han*, 111–30.

Standard History	Intro	InCos	Catalog	Annals
<i>Shiji</i>	x		x	x
<i>Book of Han</i>			x	x
<i>Book of Later Han</i>	x			x
<i>Book of Song</i>		x		x
<i>Book of Southern Qi</i>	x			x
<i>Book of Wei</i>				x
<i>Book of Jin</i>	x	x	x	x
<i>Book of Sui</i>	x	x	x	x
<i>Old Book of Tang</i>	x	x	x	x
<i>New Book of Tang</i>	x	x	x	x
<i>History of Song</i>	x	x	x	x

Table 1: Heavenly pattern monograph composition

Han first came out, and there were many things that could not be understood” 時漢書始出，多未能通者。¹² Mansvelt Beck’s work sorting out the layers of these monographs is ingenious, but it does not translate particularly well onto the *Book of Sui*: with *Book of Sui* “Tianwen zhi” we have *one compiler* writing on *multiple topics* who has left us with a *second monograph*.¹³

Experimenting with a different approach, the goal of this chapter is to read horizontally across the diverse components of the *Book of Sui* “Tianwen zhi” to reveal something of Li Chunfeng’s hand in shaping its contents and, consequentially, the historiography of science to our own day. This might seem like an impossible task faced with such a repetitive genre—a genre so repetitive that the historian Liu Zhiji 劉知幾 (661–721) argues for its abolition from the standard histories, as we will see in Chapter 13. Consider Li Chunfeng’s history of cosmology to the Sui 隋 (581–618): in the *Book of Sui*, Li repeats his *Book of Jin* monograph word for word; his *Book of Jin* monograph, in turn, appropriates 70 percent (2228 of 3185 graphs) of Shen Yue’s treatment of the topic in the *Book of Song*. This *is* repetitive, but repetition works to our advantage, because by eliminating what they share in common we can focus on what the author *added*, what he *chose to omit*, and how he acknowledges his source. To this end, I gathered the text of the Zhonghua shuju 中華書局 edition of every “Tianwen zhi” up to the *Book of Sui* as provided by Scripta Sinica;¹⁴ after purging punctuation and commentary, I then divided each text by section heading and used the “Compare Documents” function in LibreOffice Writer to analyze how they differ down to the individual graph. The whole process takes a matter of hours, and it reduces sections of several thousand graphs to the small handful that tell a story.

¹² *Hou Han shu*, 84.2784–2785; cf. Swann, *Pan Chao*, 66–67.

¹³ On the authorship of the *Book of Sui* and *Book of Jin* “Tianwen zhi,” see Chapter 2.

¹⁴ <http://hanchi.ihp.sinica.edu.tw/>

The History of the Instrument-cosmos

Li Chunfeng's *Book of Sui* monograph opens with an introductory précis describing the principles of heaven and the transmission of their study from sage-times to the Han, following which he describes several instruments from recent history. At the end of the introduction he announces the present work as the direct heritor of Sima Qian 司馬遷 (c. 145 – c. 85 BCE) and the Ban family's respective monographs in the *Shiji* and *Book of Han*. The first heading is "Heaven's Form" (Tianti 天體), which is followed by (sub)headings devoted instrument-types and instrument-related problems: "Sphere Heaven Sights" (Huntian yi 渾天儀), "Sphere Heaven Effigies" (Huntian xiang 渾天象), "Umbrella Diagrams" (Gai tu 蓋圖), "The Center of the Earth" (Di zhong 地中), "Gnomon Shadows" (Gui ying 晷影), and "Waterclocks" (Luo ke 漏刻).

Little under "Heaven's Form" is new. Li recycles the contents of his *Book of Jin* monograph word for word, directing the reader back to said monograph where he omits a lengthy citation:

自外與王蕃大同；王蕃渾天說，具於晉史

This is largely the same as Wang Fan (228–266). Wang Fan's *Huntian [xiang] shuo* is contained in the *History of Jin*.¹⁵

The only substantive difference between the two is that the *Book of Sui* continues the history of "heaven's form" beyond the Sima-Jin (265–420).

Li Chunfeng is the *direct* inheritor of *Shiji* and *Book of Han* in this genre, he tells us, because "subsequent historian-officials have left no further records" 自後史官，更無紀錄。¹⁶ This is a curious claim considering the extent of his borrowings from Shen Yue. 2430 out of 3185 graphs in Shen Yue's presentation of the instrument-cosmos consist of primary sources in citation, and 1931 of these appear expanded, abridged, or word for word in the *Book of Sui*, as do another 297 graphs of Shen's narrative and introduction (i.e. "Author x's treatise y says..."). Shen Yue's monograph, in turn, is taken from He Chengtian's 何承天 (370–447) monograph in Xu Yuan's 徐爰 (395–475) now lost *Book of Song*, but this we know because Shen Yue *does* acknowledge his source:

元嘉中，東海何承天受詔纂宋書，其志十五篇，以續馬彪漢志，其證引該博者，即而因之，亦由班固、馬遷共為一家者也。其有漏闕，及何氏後事，備加搜采，隨就補綴焉。

In [424–453], He Chengtian of Donghai received an edict to compile the monographs, in fifteen chapters, of a *Book of Song* so as to continue [Si]ma Biao's monographs of the [Later] Han (25–220). The comprehensiveness & breadth of its evidence & citations [are why I, Shen Yue,] have gone to and followed them and also what places [He Chengtian] alongside Ban Gu and [Si]ma Qian as a single expert-lineage (of historiography). Where there are omis-

¹⁵ *Sui shu*, 19.507.

¹⁶ *Sui shu*, 19.505. *Shiguan* 史官 can also be read as "the [Grand] Clerk's Office," typically styled "the Astronomical Bureau," but Li Chunfeng would appear to be referring to standard history "historians" in this case. On the Clerk's Office, see Note 95.

sions & elisions, and were we come to events after Mr. He, [I] patched things up as [I] go by supplying what [I myself] have gathered.¹⁷

Both Shen Yue and Xu Yuan's respective histories of the Liu-Song (420–479) were extant in Li Chunfeng's day.¹⁸ Li, who speaks glowingly of the *Shiji* and *Book of Han*, acknowledges neither *Book of Song* as his source, nor does he acknowledge their *existence* except twice by point of criticism, as we shall see below. Without a word, Li takes 70 percent of Shen Yue's account of "heaven's form" and turns it into refutation of its own unacknowledged author(s).

To understand what Li Chunfeng has done, we must begin with the building blocks of Shen Yue (and He Chengtian's) history. Shen frames the history of "heaven's form" in terms of three "schools" or "expert-lineages" (*jia* 家): and "sphere heaven" (*hun tian* 渾天), "umbrella heaven" (*gai tian* 蓋天), and "expansive night" (*xuan ye* 宣夜). By the second century, supposedly, "expansive night" was lost, "umbrella heaven" was disproven, and "sphere heaven" was accepted as truth. We shall refer to this narrative as THREE SCHOOLS, ONE WINNER. There is already a substantial body of research on these "schools," and since it is not the contents of their cosmology that matters here, I offer the simplified version:

1. Sphere heaven: Earth is a flat disk floating at the center of a spherical heaven; one version says it floats on water, another on *qi*. Heaven rotates on an inclined axis rising 36 *du* ($\approx 35^\circ$) above the northern horizon. Passing beneath the earth, heaven carries the sun, moon, and stars above and below the horizon. Eclipses are due to the earth's shadow. The position at which the sun and moon rise, set, and culminate changes seasonally due to their travelling on a "yellow road" (ecliptic) that runs oblique to the "red road" (equator).
2. Umbrella heaven: Heaven and earth are parallel plates mirroring one another above and below; one version has it that they are flat, another that they are curved/tapered downwards. Heaven rotates upon a vertical axis at their center. Being one above the other, the edge of heaven meets the horizon only by optical illusion, and the apparent rising and setting of the sun (and other celestial objects) is likewise the result of optical illusion and the finite reach of light/eyesight. Eclipses are due to yin and yang. The position at which the sun and moon rise, set, and culminate changes seasonally due to their cycling between concentric rings that place them closer and further from the celestial pole.
3. Expansive night: Heaven has no substance, its color is an optical illusion, and celestial objects simply float in a void.¹⁹

¹⁷ *Song shu*, 11.205–206.

¹⁸ For bibliographic records of Xu Yuan's *Book of Song*, see *Sui shu*, 33.955, and *Jiu Tang shu*, 46.1989. He Chengtian's monograph therein is also cited in 729 in *Kaiyuan zhanjing*, 1.28b–29a.

¹⁹ For more on these and the other cosmologies mentioned in this section, see the works cited in Note 2.

Shen Yue recounts the history of “heaven’s form” in this order, starting with the purported winner. It is clear that the order is intended to be *chronological*, because he devotes the final paragraph to post-second-century CE entries, and the penultimate paragraph to the *Gnomon of Zhou*, which Shen argues is “falsely attributed” 假託 to the Duke of Zhou (r. 1042–1036 BCE), around which the text is written. Shen presents opinions for and against the sage-time origins of sphere heaven, concluding only that “the apparatus was at least already there in Western Han Chang’an” 以此而推，則西漢長安已有其器矣，referring to Luoxia Hong’s 落下閎 reputed work with a “sphere heaven” armillary sphere in the second century BCE.²⁰ Shen Yue’s chronology, lastly, proceeds in (decreasing) order of epistemic merit: sphere heaven is the ONE WINNER, *Gnomon of Zhou* umbrella heaven is “the creation of those fond of oddities” 好異者之所作也，and post-second-century CE theories are “all [nothing but] curious chatter that miss the mark by a great distance” 皆好異之談，失之遠矣.²¹ In short, Shen Yue presents the history of “heaven’s form” cosmology as one of loss and degeneration, the assumption being that good knowledge is necessarily “ancient” (*gu* 古).

Li Chunfeng maintains Shen Yue’s framework—THREE SCHOOLS, ONE WINNER—and his assignments of merit—that the post-second-century CE theories are “all whimsical & fantastical explanations, being not those that discuss heaven by plumbing the numbers” 皆好奇徇異之說，非極數談天者也²²—but he reverses Shen Yue’s chronology and order of presentation. Li begins with *Gnomon of Zhou* umbrellism, with which he attributes the highest possible antiquity:

其本庖犧氏立周天曆度，其所傳則周公受於殷高，周人志之，故曰周髀

Its origins [began] with [Fu]xi’s establishment of the *li du* of the circuit of heaven, and its transmission [began] with the Duke of Zhou receiving [it] from Yin Gao; men of Zhou made a treatise of it, which is why it is called the *Gnomon of Zhou*.²³

He proceeds from there to the “lost school” of expansive night—for which *he*, in the seventh century, is able to conjure a citation from one Xi Meng 郗萌 (1st cent. BCE/CE?)—and the “whimsical & fantastical explanations” of the third century CE on. Last on Li Chunfeng’s list is sphere heaven, the invention of which he definitively places *after* the *Gnomon of Zhou* in the probable hands of Luoxia Hong. Having returned sphere heaven to historical time, Li concludes the section “Heaven’s Form” with a history of the problem of the apparent diameter of the sun from Confucius (551–479 BCE) to Jiang Ji 姜岌 (fl. 384) and Zu Geng 祖暅 (fl. 504–510), narrating how subsequent generations made new observations, new inferences, new tools, and new measurements within spherism to ultimately resolve a problem that got the best of Confucius. In short, Li Chunfeng has transformed Shen Yue’s regres-

²⁰ *Song shu*, 23.678. While later sources are consistent in attributing

²¹ *Song shu*, 23.679, 680.

²² *Jin shu*, 11.280; *Sui shu*, 19.508.

²³ *Jin shu*, 11.278; *Sui shu*, 19.505.

sive history of cosmology into an argument for the “accumulation” (*ji* 積, *lei* 累) of human knowledge, *his* assumption being that good knowledge is necessarily “new” (*xin* 新) or “modern” (*jin* 今).²⁴

This is in fitting with the values and progressivist vision we see in Li Chunfeng’s “Lü-li zhi” 律曆志, as discussed in Chapter 3. Progress has become a contentious topic in the history of science in the last half-century, but rather than zoom out to “science,” let us focus instead on how Li Chunfeng’s specific claims were contentious in his own day.²⁵

First, Li Chunfeng’s use of Shen Yue’s text would look to us like plagiarism, and while standards of plagiarism may differ, Li’s was assuredly a violation of contemporary norms. *Shen Yue* certainly feels the need to acknowledge his commensurate appropriation of He Chengtian’s work, and so too does Li Chunfeng under most any other circumstances. The next largest source for the *Book of Sui* “Tianwen zhi” is the respective monographs of the *Shiji* and *Book of Han*, passages from which one finds scattered throughout the “Canon Stars” 經星 section discussed below. There, admittedly, Li does not *name* these sources, but he *is* careful to bracket borrowed words with *yue* 曰 (“it is said”), explaining his citation practices in the introduction:

馬遷天官書及班氏所載，妖星暈珥，雲氣虹霓，存其大綱，未能備舉。自後史官，更無紀錄。...今略舉其形名占驗，次之經星之末云。

The demon stars, halos, rings, clouds, vapors, and rainbows recorded by [Si]Ma Qian’s “Tianguan shu” and the Ban clan’s “Tianwen zhi” conserve the big picture, but they were unable to be exhaustive, and subsequent historian-officials have left no further records. ... Here [I] shall cursorily list their forms & names, readings & verifications, and arrange them at the end of the “Canon Stars” [section].²⁶

One could compile a list of every instance where he *does* name names, or where he fills out names left blank by Shen Yue, but what speaks the loudest to Li Chunfeng’s authorial ethics is perhaps this: the two places where Li openly antagonizes his predecessors are, ironically, as concerns the *misattribution* of others’ creations (below).²⁷ Whether or not it was for his treatment of Shen Yue specifically, one notes that Li Chunfeng’s official biography concludes with an unexplained defense of his reputation: “At the time, technical [experts] suspected that he had outside assistance, and that [his success] was not brought about by learning [on his part], but [their suspicions] were never observed (proven)” 當時術者疑其別有役使，不因學習所致，然竟不能測也。²⁸

Second, Li Chunfeng is probably wrong about his chronology. As to sphere heaven, the earliest extant reference goes back to

²⁴ See Morgan, *Astral Sciences*, ch. 6, “What the Ancients Had Yet to Learn.”

²⁵ On “progress” in the astral sciences, see Sivin, “On the Limits of Empirical Knowledge”; Sivin, *Granting the Seasons*, 131–132, 551–557; Henderson, “Premodern Chinese Notions of Astronomical History and Calendrical Time”; Morgan, *Astral Sciences*, ch. 6, “What the Ancients Had Yet to Learn.”

²⁶ *Sui shu*, 19.505.

²⁷ See Morgan, *Astral Sciences*, ch. 6, “What the Ancients Had Yet to Learn.”

²⁸ *Jiu Tang shu*, 79.2719.

Yang Xiong 揚雄 (53–18 BCE), who tells us that “Luoxia Hong (fl. 104 BCE) *ying*-ed it, Xianyu Wangren (fl. 78–74 BCE) *du*-ed it, and Geng [Shouchang] (fl. 52 BCE) the palace assistant *xiang*-ed it” 落下閔營之，鮮于妄人度之，耿中丞象之。²⁹ It is not clear what this means, but his friend Huan Tan 桓譚 (c. 43 BCE – 28 CE) records a conversation between Yang Xiong and an “old Yellow Gate (palace) artisan who made sphere heaven [armillary spheres]” 黃門作渾天老工, which would seem to confirm that the instrument as well as the cosmology were well in place by the mid-first century BCE.³⁰ Polar distance data in *Mr. Shi’s Star Canon* (*Shishi xingjing* 石氏星經) furthermore suggests the use of such an instrument in Xianyu Wangren’s observation program of 78–75 BCE.³¹ As to umbrella heaven, the first reliable evidence also goes back to Yang Xiong—back to his eight-point rebuttal of the theory as cited in Li Chunfeng’s *Book of Sui* monograph.³² Later writers identify the *Gnomon of Zhou* as its *locus classicus*, but the *Gnomon of Zhou* is a potentially cumulative pseudepigraphon of unknown date; moreover, as Christopher Cullen shows, much of its presentation of umbrella heaven is a tacit polemic against the sphere.³³ In short, the two “schools” appear in the historical record around the same time, and the earliest evidence for the umbrella is constructed around the sphere, all of which favors Shen Yue’s chronology over Li Chunfeng’s.

Third, Li Chunfeng himself is inconsistent about this chronology. In the *Book of Sui* monograph, he criticizes Ma Rong 馬融 (79–166) for falsely attributing the *Book of Document’s xuanji yuheng* 璇璣玉衡 (“rotating mechanism & jade traverse”) as a prehistoric “sphere sight” armillary sphere. In the *Book of Jin*, however, Li cites Ma Rong’s disciple Zheng Xuan 鄭玄 (127–200) to argue the contrary:

鄭玄謂以玉為渾儀也。春秋文曜鉤云：「唐堯即位，羲和立渾儀。」此則儀象之設，其來遠矣。繇代相傳，史官禁密，學者不覩，故宣、蓋沸騰。

Zheng Xuan says that [the “rotating mechanism & jade traverse”] was a sphere sight made of jade. The *Spring & Autumn Annals* [weft] *Wen yao gou* says: “[When Sage King] Yao of Tang took the throne the Xi & He [brothers] established the sphere sight.” This then was the institution of the sight-effigy (armillary sphere), its origins going back a long ways. [This] was handed down through [each] continuous age, [but access to] the Clerk’s Office was tightly forbidden, and scholars did not see [it], and thus did expansive [night] & umbrella [heaven] roil in competition.³⁴

²⁹ *Yangzi fayan*, 10.1b; cf. Cullen, *Astronomy and Mathematics*, 61.

³⁰ *Xin lun*, cited in *Tai ping yulan*, 2.11a–b.

³¹ See Sun Xiaochun and Kistemaker, *The Chinese Sky during the Han*.

³² “Nan gaitian ba shi” 難蓋天八事, cited in *Sui shu*, 17.506–507; cf. Cullen, “Cosmographical Discussions,” 150–59; Jin Zumeng, *Zhongguo gu yuzhoulun*, 88–97; Chen Meidong, *Zhongguo gudai tianwenxue sixiang*, 203–209.

³³ *Astronomy and Mathematics*, esp. 138–56.

³⁴ *Jin shu*, 11.284. Note that Li Chunfeng singles out Zheng Xuan for criticism on the same point in *Sui shu*, 19.516.

Earlier, in petitioning the throne to finance the construction of his own ill-fated armillary sphere in 627, Li Chunfeng likewise opens thus:

臣案虞書稱，舜在璿璣玉衡，以齊七政。則是古以混天儀考七曜之盈縮也。

[I, Your] servant note that the *Documents of Yu* say that “Shun attended to the rotating mechanism & jade traverse so as to level the seven governors/government matters.”³⁵ This is thus [proof of] how in antiquity the sphere heaven sight was used to test the excess & deficit of the [motion of the] seven luminaries (sun, moon, and five naked-eye planets).³⁶

Given that his monograph in the *Book of Sui* (closed 656) cites that in the *Book of Jin* (written 646–648), it would seem that he wrote the *Book of Sui* history last and that he had since changed his mind about the sage-time history of sphere heaven.³⁷

Fourth, the THREE SCHOOLS, ONE WINNER narrative that Li Chunfeng appropriates from Shen Yue (and He Chengtian?) is itself a contentious historical claim made to close an open debate.³⁸ As it is repeated in the monographs of Shen Yue, Li Chunfeng, and all subsequent scholarship on the topic, that narrative is based upon the following petition made by Cai Yong in 178:

論天體者三家，宣夜之學，絕無師法。周髀術數具存，考驗天狀，多所違失。惟渾天僅得其情。

The discourse on heaven’s form is comprised of three expert-lineages (*jia*), but the study of expansive night has died out and has no master method. Both the procedures & numbers (*shu shu*) of the *Gnomon of Zhou* survive, but when examined (*kao*) & verified (*yan*) against the case of heaven, there is much that misses the mark. It is only sphere heaven which completely grasps the true circumstances (*qing*).³⁹

That is where the modern historian tends to stop.⁴⁰ The memorial as cited in both Shen and Li’s monographs continues, turning from the abstract to the concrete.

今史官所用候臺銅儀，則其法也。立八尺圓體，而具天地之形，以正黃道，占察發斂，以行日月，以步五緯，精微深妙，百世不易之道也。官有其器而無本書，前志亦闕

The observatory bronze sight employed by the Clerk’s Office of our day is patterned upon this model (*fa*): a sphere erected eight *chi* (1.85 m) [in diameter] and possessed of the forms of

³⁵ Citing *Shangshu zhushu*, 3.35b.

³⁶ *Jiu Tang shu*, 79.2717–18.

³⁷ On the sequence of events surrounding the *Book of Sui* and *Book of Jin* monograph projects, see Chapter 2. On the *xuanji yuheng*, see Cullen and Farrer, “On the Term *hsüan chi*.”

³⁸ The following analysis builds off of that in Morgan, “A Sphere unto Itself.”

³⁹ *Song shu*, 23.673; *Jin shu*, 11.278; *Sui shu*, 19.505, *passim*; tr. modified from Ho Peng Yoke, *The Astronomical Chapters of the Chin Shu*, 49.

⁴⁰ See for example Maspero, “L’astronomie chinoise avant les Han,” 334; Needham, *Science and Civilisation in China*, vol.3, 210; Nakayama Shigeru, *A History of Japanese Astronomy*, 35–36; Cullen, “Cosmographical Discussions,” 206–7; Cullen, *Astronomy and Mathematics*, 37–38; Jin Zumeng, *Zhongguo gu yuzhou lun*, 94–95; Chen Meidong, *Zhongguo gudai tianwenxue sixiang*, 128.

heaven & earth by which one aligns the yellow road to observe the release & restrain (of luminary motion), by which one moves the sun & moon, and by which one paces the five [planets]—fine & subtle, profound & mysterious, it is a *dao* that shall remain unchanged for a hundred generations. The officials have the apparatus but not the original book(s), and the previous monographs are, for their part, faulty...⁴¹

This is where *Li Chunfeng* stops. In doing so, however, he omits one rather important detail: the point of Cai Yong's petition.

而不論，本欲寢伏儀下，思惟微意，按度成數，以著篇章。罪惡無狀，投畀有北，灰滅雨絕，勢路無由。宜問羣臣，下及巖穴，知渾天之意者，使述其義。
... and do not discuss it. [I] had desired originally to lie beneath the sight [to] contemplate its subtleties and master its numbers according to *du* so as to write it up into a piece; for [my] inexcusable crime, [however], [I] have been banished to the north to be annihilated by dust & broken by rain, and denied access to any route to influence. It would be appropriate [then] to inquire among [Your] ministers, and down all the way to [hermit] grottoes, about someone knowledgeable about the idea of sphere heaven and order [him] to recount its substance.⁴²

The Cai Yong of 178 is an odd candidate for spokesman of the history of cosmology in China. One notes that Cai Yong is petitioning the throne from the northern wastes of Shuofang 朔方 and that sphere heaven is a pretext for his implied request to return to civilization. This should give us pause; so too should the fact that Cai Yong was, ironically, “banished to the north to be annihilated by dust & broken by rain” that very year on the charge of *tianwen* malpractice—the politically incorrect reading of “daemonic anomalies” 妖異 in the summer of 177.⁴³ One might point to Cai's participation at that time in the compilation of the *tianwen* and *liu-li* monographs for the Eastern Han as evidence of his status as a principled expert, but there one notes that Cai had to rely on the technical expertise of his co-author, Liu Hong 劉洪 (fl. 167–206), because “[Cai] Yong could compose text... and [Liu] Hong could do the calculations” 豈能著文... 洪能為算.⁴⁴

Having sufficiently impugned Cai Yong's credibility, let us consider the specific contents of THREE SCHOOLS, ONE WINNER. First, Cai Yong's narrative is an odd mixture of triumphalism and defeatism: the sphere has already won, and the sphere is already lost. If “it is only sphere heaven which completely grasps the true circumstances,” why do “the officials have the apparatus but not the original book(s),” thus necessitating Cai Yong to “write it up into a piece” to save it? Second, Cai Yong is either ignorant of or purposefully omits everything that had happened in spherism since

⁴¹ *Song shu*, 23.673; *Jin shu*, 11.278; tr. modified from Ho Peng Yoke, *The Astronomical Chapters of the Chin Shu*, 49.

⁴² *Song shu*, 23.673.

⁴³ *Hou Han shu*, 60B.1998–1999.

⁴⁴ *Hou Han shu*, *zhi* 3, 3082.

the “observatory bronze sight” of 103.⁴⁵ Nowhere, for example, does he mention Grand Clerk Zhang Heng’s 張衡 (78–139) recent, prolific, and celebrated contributions to the theory in terms of writing and physical installations.⁴⁶ Neither does he mention Wang Chong’s 王充 (27 – c. 100) recent defense of *Gnomon of Zhou* umbrellism in *Lunheng* 論衡, a copy of which, to be fair, Cai only obtained after returning from exile in 179.⁴⁷ It would seem that, from exile, Cai Yong’s determinations on *tianwen* were every bit as brash as those that landed him there in the first place.

The biggest problem with THREE SCHOOLS, ONE WINNER is perhaps what to make of Cai Yong, Shen Yue, and Li Chunfeng’s delineation of *jia*. The very term is first of all ambiguous, potentially indicating one or more “experts” (or books) alone or as belonging to a “lineage” in the sense of a “family,” a “school,” or a vaguely defined “school of thought,” identification being potentially retrospective.⁴⁸ One assumes that what historians identify as the “umbrella heaven *jia*” share/s at least the same idea of “heaven’s form,” but such is not exactly the case. Shen Yue introduces “the procedures of umbrella heaven” 蓋天之術 with a description of non-planar, fitting-bowl umbrellism:

天如覆蓋，地如覆盆，地中高而四隕，日月隨天轉運，隱地之高，以為晝夜也。天地相去凡八萬里，天地之中，高於外衡六萬里，地上之高，高於天之外衡二萬里也。

Heaven is like a covering umbrella, and earth is like a covering (upside down) basin. The earth is tall in the center and tapers at the four [edges]; the sun & moon revolve with the rotation of heaven, hiding [& reappearing from behind] the tallness of the earth to result in day & night. Heaven & earth are 80,000 *li* (33,264 km) apart; the center of heaven & earth (sic.) is 60,000 *li* (24,948 km) taller than the outer *heng* 衡 (the path of the sun at winter solstice), and the height of the top of the earth is 20,000 *li* (8,316 km) taller than heaven’s outer *heng*.⁴⁹

Among the *jia* that historians like Shen Yue identify with umbrella heaven, however, we also find the parallel-plane version of Wang Chong, where “heaven is perfectly flat, no different from the earth” 天平正，與地無異, and where, as a consequence, “the sun re-

⁴⁵ The “Grand Clerk yellow-path bronze sight” 太史黃道銅儀 commissioned for the Luoyang observatory in 103 is described in *Hou Han shu*, *zhi* 2, 3028–3030.

⁴⁶ Zhang Heng is famously attributed with a water-driven armillary sphere installed next to the “bronze sight” at the Luoyang observatory as well as with the authorship of the *Lingxian* 靈憲 and *Huntian yi* 渾天儀, which, still extant, have become the single two most classic treatises on the topic of sphere heaven cosmology and instrumentation. On Zhang Heng and his contributions to spherism more generally, see Chen Jiujin, “Zhang Heng de tianwenxue sixiang”; Xu Jie, *Zhang Heng pingzhuan*; Lien, “Zhang Heng, Eastern Han Polymath.” On the *Lingxian*, see Hashimoto Keizō, “Reiken.” On the *Huntian yi*, see Arai Shinji, “Chō Kō Kontengi”; Cullen, “Seeing the Appearances”; Lien, “Zhang Heng’s *Huntian yi zhu* Revisited.”

⁴⁷ For Cai Yong’s reception of the *Lunheng*, see *Baopuzi* 抱樸子, cited in *Yiwen leiju*, 55.8b, and *Yuan Shansong shu* 袁山松書, cited in *Hou Han shu*, 49.1629 (commentary).

⁴⁸ On *jia*, see Csikszentmihalyi and Nylan, “Constructing Lineages and Inventing Traditions through Exemplary Figures in Early China.”

⁴⁹ *Song shu*, 23.679.

volves westward [where] it can no longer be seen (due to its distance) rather than setting [beneath the earth-horizon]” 日西轉不復見者非入。⁵⁰ The form and mechanics of these two umbrella heavens are different, leading one to wonder about the merits of their identification. More troubling still is Li Chunfeng’s labelling of Liang Wudi’s 梁武帝 (r. 502–549) cosmology as “completely the same as the text of the *Gnomon of Zhou*” 全同周髀之文,⁵¹ given that his is a Buddhist Mt. Meru cosmology that reduces “heaven’s form” to “pure & floating *qi*” 清浮之氣 of no particular shape, size, distance, or function.⁵²

Rolling Buddhist cosmology into “umbrella heaven” is Li Chunfeng’s way of dismissing it: Liang Wudi, Li explains, “probably just wanted to establish some fresh idea to reject the discourse on sphere heaven” 蓋立新意，以排渾天之論而已。⁵³ “Umbrella heaven,” in other words, is not so much a coherent and self-acknowledged “school” as it is a blanket accusation of counter-spherist polemics. This is not the only cosmology that Shen Yue and Li Chunfeng have weeded from the garden of THREE SCHOOLS, ONE WINNER. As to the “curious chatter” of Yao Xin 姚信 (3rd cent.), Yu Song 虞聳 (fl. c. 265), and Yu Xi 虞喜 (fl. 335–342), both historians are careful to label theirs as *shuo* 說 (“explanations”) and, thus, as categorically distinct from *jia*. What’s the difference? *Shuo* would by contrast appear connote isolation, which is ironic considering the Yus are the only grandfather-grandson pair—the only true *family*—in the history of “heaven’s form.” Li Chunfeng would insist that the difference is “plumbing the numbers,” but his own description of expansive night hardly meets this criterion any better than the “curious chatter.”⁵⁴ We might instead conclude that the difference is simply one of tradition—that the cutoff date for incorporation was in 178—but here again Li Chunfeng is inconsistent.

In his omen compendium of 645, finished one year prior to his involvement with the *Book of Jin*, Li Chunfeng lists *eight jia* of cosmology covering Cai Yong’s “three schools,” the three post-178 “explanations,” Wang Chong as now distinct from “umbrella heaven,” and an otherwise unheard of theory suggestive of foreign influence (Table 2). Li insists that “of these eight *jia*, sphere heaven is dearest [to the truth]” 凡此八家，渾天最親。⁵⁵ Even where he maintains THREE SCHOOLS, ONE WINNER for the purposes of history-writing, one notes, Li cites Liu Zhuo 劉焯 (544–610) railing against the existence of “different schools” 異家 in 604, listing “three explanations” 三說 and “four heavens” 四天 for a total of “seven distinct varieties of explanation” 七種殊說。⁵⁶ Modern scholars are mostly content to perpetuate THREE SCHOOLS, ONE

⁵⁰ *Lunheng*, 11.8b, 9a.

⁵¹ *Sui shu*, 19.507.

⁵² Cited in *Kaiyuan zhanjing*, 1.33b.

⁵³ *Sui shu*, 19.507. On the exclusion of Sanskrit-origin theories from the history of “heaven’s form,” see Morgan, “A Sphere unto Itself.”

⁵⁴ See *Sui shu*, 19.507; *Jin shu*, 11.279; cf. Ho Peng Yoke, *The Astronomical Chapters of the Chin Shu*, 52.

⁵⁵ *Yisi zhan*, 1.1b.

⁵⁶ *Sui shu*, 19.521.

no.	School	Notes
1	渾天 sphere heaven,	that which [I] record here from Zhang Heng's <i>Lingxian</i> ;
2	宣夜 expansive night,	which has died out and has no master method;
3	蓋天 umbrella heaven,	recorded in the Gnomon of Zhou;
4	軒天 baseboard heaven,	explained by Yao Xin;
5	穹天 vault heaven,	dreamt up by Yu Song;
6	安天 secure heaven,	described by Yu Xi;
7	方天 square heaven,	discoursed by Wang Chong;
8	四天 quadruple heaven,	sayings attributed to (the?) Yao Hu 祆胡.

Table 2: Li Chunfeng's "eight schools" of cosmology as listed in *Yisi zhan* (645). Source: *Yisi zhan*, 1.1a–b.

WINNER, declaring the history of cosmology in China settled by second century and dead by the eighth, when, in Marc Kalinowski's words, "après la reconnaissance de la supériorité du modèle *Huntian* sur le plan instrumental, les questions de cosmographie n'ont plus guère suscité d'intérêt parmi les spécialistes."⁵⁷ Chen Meidong 陳美東 points out how the number of *jia* reaches as high as eighteen by the Song 宋 (960–1279), but the power of THREE SCHOOLS, ONE WINNER as canonized by the standard histories is such that it continues to frame how we approach the history of astronomy in China to our day.⁵⁸

Let us now turn briefly to Li Chunfeng's subheadings on astronomical instruments. We already noted in Chapter 3 that the *Book of Sui* is the first to add an instrument catalog to the "Lü-li zhi," and so too is it the first to do the same for the "Tianwen zhi." Beyond simply outlining the variety of astronomical instrumentation, and providing each a history, the "Tianwen zhi" instrument subheadings serve a similar function vis-à-vis the narrative to which it is appended as that in the "Lü-li zhi": framing the evidence around Li's preferred historical winner. This instrument subheadings have already been treated in greater depth elsewhere, so I shall focus here on two points of Li Chunfeng's authorial intervention.⁵⁹

First, Li Chunfeng enters astronomical instruments into consideration only really as they reflect upon questions of cosmology. Armillary spheres, "umbrella diagrams," gnomons, and water-clocks have *other functions*, of course, but they are not those with which Li is interested here. Mostly, Li is interested in the "shadow rule" upon which *Gnomon of Zhou* umbrellism stands (or, in this case, falls flat):

周髀長八尺。夏至之日，晷尺六寸。髀者股也，正晷者句也。正南千里，句尺五寸；正北千里，句尺七寸。日益表南，晷日益長。

⁵⁷ "Astrologie calendaire," 71, cf. Kalinowski, "Le calcul du rayon céleste," 34; Nakayama Shigeru, *A History of Japanese Astronomy*, 127; Cullen, "Cosmographical Discussions," 26–30, 375–379.

⁵⁸ Chen Meidong, *Zhongguo gudai tianwenxue sixiang*, 128–30.

⁵⁹ On Li Chunfeng's *Book of Sui* instrument catalog, see Morgan, "Sphere Confusion"; Morgan, *Astral Sciences*, ch. 3, "Observing the Signs."

The *zhou bi* (Zhou gnomon) is eight *chi* in length. On the day of the summer solstice its [noon] shadow is one *chi* and six *cun*. The *bi* is the altitude [of the right-angled triangle], and the exact [noon] shadow is the base. 1000 *li* due south the base is one *chi* and five *cun*, and 1000 *li* due north the base is one *chi* and seven *cun*. The further south the sun is, the longer the shadow.⁶⁰

In short, the *Gnomon of Zhou* dictates that a 1000 *li* displacement N–S corresponds to a 1 *cun* difference in midday shadow-length taken from the same gnomon on the same day, and subsequent cosmic dimensions are to be extrapolated via the rule that 1 *cun* at the observer equals 1000 *li* in heaven.⁶¹

It is to the “shadow rule,” curiously, that to which Li Chunfeng devotes the near entirety of his entry on the “umbrella diagram” star chart, whose only relation to the gnomon is its association with the work by that name—“Gnomon Shadows,” let us recall, is a different subheading.⁶² After a short historical introduction, Li bemoans that the Clerk’s Office “never saw a change to the sphere effigy” 莫有更為渾象者矣,⁶³ to which he adds Liu Zhuo’s lengthy screed of 604 on the superiority of sphere heaven. Here is a brief excerpt:

『周官』夏至日影尺有五寸。張衡、鄭玄、王蕃、陸續先儒等，皆以為影千里差一寸。言南戴日下萬五千里，表影正同，天高乃異。考之算法，必為不可。寸差千里，亦無典說，明為意斷，事不可依。今交、愛之州，表北無影，計無萬里，南過戴日。是千里一寸，非其實差。

The *Offices of Zhou* [states] that the [noon]day shadow at summer solstice is 1 *chi* 5 *cun*. Previous scholars such as Zhang Heng, Zheng Xuan, Wang Fan, and Lu Ji 陸續 (188 – 219) all took it [for granted] that the shadow differs by one *cun* for a thousand *li*. It is said that the southern sub-solar point (i.e. the Tropic of Cancer) is 15,000 *li* below us but that the gnomon shadow is exactly the same due to the difference in heaven’s height. Examination (*kao*) via computational methods (*suan fa* 算法) [shows that] this is certainly impossible. That a *cun* difference [corresponds to] a thousand *li* is likewise devoid of canonical explanation (precedent); it is clearly an arbitrary supposition which cannot be taken for granted. Now, in Jiao[zhou] 交州 and Aizhou 愛州 (administrative regions stretching into modern Vietnam), there is no shadow north of the gnomon [at summer solstice], [by which we can] estimate that in less than 10,000 *li* one goes south past the sub-solar point. This is [proof that] a thousand *li* per *cun* is not the true (*shi* 實) difference.⁶⁴

In response to Liu Zhuo’s more modest request for “one water-worker together with [a] gentleman conversant in the art of calcu-

⁶⁰ *Zhoubi suanjing*, A2.7a–b; tr. Cullen, *Astronomy and Mathematics*, 178.

⁶¹ For more on the “shadow rule” and its centrality to *Gnomon of Zhou* umbrellism, see Cullen, *Astronomy and Mathematics*, 111–115; Kalinowski, “Le calcul du rayon céleste,” 24–34.

⁶² Li Chunfeng’s sparse descriptions of the “umbrella diagram” seem to refer to a type of planar or concave star chart; see Qin Jianming, “Gaitian tuyi kao”; cf. Morgan, *Astral Sciences*, ch. 3, “Observing the Signs.”

⁶³ *Sui shu*, 19.520.

⁶⁴ *Sui shu*, 19.521–522.

lation” 一水工并解算術士 to determine the true difference, Li Chunfeng tells us, the Sui court ordered an empire-wide commandery-level gnomon survey.⁶⁵ This survey may have been abandoned due to Liu’s death, but Li manages to cull sufficient data from miscellaneous observations to offer upper and lower limits in a personal note (*an* 案) at the end of the “Gnomonics” subsection: it’s between 600 to 250 *li* per *cun*.⁶⁶ At that, Li Chunfeng concludes, the *Gnomon of Zhou* is empirically disproven—“the ‘thousand *li*’ saying is insufficient to depend upon” 千里之言，未足依也—not that that has anything to do with “umbrella diagram” star charts.⁶⁷

The second point where Li Chunfeng’s voice comes to the fore on the topic of instrumentation is under “Sphere Heaven Sight.” This is the only place where Li actually acknowledges Shen Yue’s history. In “Sphere Heaven Sight,” Li opens with the *xuanji yuheng* from the *Book of Documents*, citing weft texts that explicitly identify this as an armillary sphere. Li no longer agrees with this point (above), so here in the *Book of Sui* he presents the alternative: “earlier scholars” 先儒, he notes, had glossed this as synecdoche for the Northern Dipper (Beidou 北斗; UMa), whose stars include Xuan 璇 (UMa β), Ji 璣 (UMa γ), and Yuheng 玉衡 (UMa ϵ). Confident that he (now) has the right answer, Li tells us who is to blame for this nonsense about a prehistoric armillary sphere:

載筆之官，莫之或辨，史遷、班固猶且致疑，馬季長創謂璣衡為渾天儀。

No brush-toting official (historian) ever makes the distinction, even [Grand] Clerk [Sima] Qian and Ban Gu cast the matter into doubt (by explicitly identifying it with Northern Dipper), [but] it was Ma [Rong] who first conceived of saying that [*xuanji*] *yuheng* was the sphere heaven sight.⁶⁸

Other than himself, in the *Book of Jin*, the only “brush-toting official” to have written on the topic in a standard history monograph since Sima Qian and Ban Gu’s day is Shen Yue and, possibly, He

⁶⁵ *Sui shu*, 19.522.

⁶⁶ For the upper limit, Li compares a measurement in 442 by a Liu-Song emissary in Jiaozhou to He Chengtian’s measurements at Yangcheng 陽城, from which he derives the rate 600 *li* per *cun*. For the lower limit, he compares measurements made in the Liang capital of Jiankang 建康 between 535 to 546 to one performed at the Northern Wei 北魏 (386–535) capital of Luoyang 洛陽 in 508, from which he derives the rate 250 *li* per *cun*.

⁶⁷ *Sui shu*, 19.526. For more on the history of such surveys, see Beer et al., “An 8th-Century Meridian Line.”

⁶⁸ *Sui shu*, 19.516. Specifically, the *History of Song* cites Ma Rong as saying, “The form of heaven above cannot be known; as to matters of measuring heaven that appear in the classics, there is only the matter of the *yuheng*. The *yuheng* is none other than the [armillary] Sphere instrument of our day” 上天之體不可得知，測天之事見於經者，惟有璣衡一事。璣衡者，即今之渾儀也 (cited in *Song shi*, 48.951). One notes that Ma Rong was not *unaware* of the *Book of Han*, since he “received its reading from [its author, Ban] Zhao” 從昭受讀 in the Eastern Observatory (Dongguan 東觀) circa 110, and he and his elder brother Xu hand a hand in its final version; see *Hou Han shu*, 84.2784–2785; cf. Note 12.

Chengtian.⁶⁹ This criticism is somewhat veiled, but Li Chunfeng gets more explicit further down.

In 417, Sima Jin forces retook the city of Chang'an, transporting an armillary sphere found there back to a royal residence in Jiankang in the following year, the object eventually ending up in the imperial park at Hualin 華林. The Shen Yue monograph reports that “[they] had obtained [Zhang] Heng’s old device, and though the sight appeared intact, it was not adorned with the canon stars & seven luminaries [as expected]” 得衡舊器，儀狀雖舉，不綴經星七曜。⁷⁰ According to Li Chunfeng, however, “inspection (*jian*) of the engraving [reveals that] it was constructed by Clerk’s Office Assistant Kong Ting of Nanyang in year 6 of the [Xiongnu] imposter Liu Yao’s Glory Inception reign (i.e. 323) 檢其鑄題，是偽劉曜光初六年，史官丞南陽孔挺所造。⁷¹ Li has once again proven his predecessors wrong, and he is all too happy to emphasize their mistake:

宋御史中丞何承天及太中大夫徐爰，各著宋史，咸以為即張衡所造...梁尚書沈約著宋史，亦云然，皆失之遠矣。
Song Palace Aid to the Censor-in-chief He Chengtian and Superior Grand Master of the Palace Xu Yuan each wrote a history of the [Liu]-Song wherein both took [the Kong Ting sphere] as Zhang Heng’s construction. ... Liang Master of Writing Shen Yue wrote a history of the [Liu]-Song which also says as much—all of them miss the mark by a great distance.⁷²

The Catalog

The style and contents of the *Book of Sui*’s catalog of celestial lore reads much like any other in the genre. It proceeds from the “canon stars” (*jing xing* 經星) to the luminaries (sun, moon, and planets) and onto rare and aberrant phenomena (e.g. comets, shooting stars, and the “freakish” [*yao* 妖]). Each entry begins with a description of, in some combination, the body’s shape, size, position, composition, alternate names, associations, and significance, after which we are provided specific interpretative formulae. A brief example suffices to illustrate the format:

天江四星在尾北，主太陰。江星不具，天下津河關道不通。明若動搖，大水出，大兵起。參差則馬貴。熒惑守之，有立王。客星入之，河津絕。

Celestial River (Tianjiang 天江; 36,θ,b,c Oph), four stars, is north of Tail._{L06} (Wei 尾; ε-λ Sco). It presides over the great yin. [If] the river stars incomplete[ly visible], the fords and passes of the sub-celestial realm are unopened. [If], when bright, they waver, great

⁶⁹ For Sima Qian and Ban Gu’s—actually Ban Zhao’s—identification of the *xuanji yuheng* with the Northern Dipper, see *SJ* 27.1291 and *HS* 26.1274. One notes that the *Book of Later Han* and *Book of Wei tianwen* monographs are silent on the issue, leaving Xu Yuan and Shen Yue’s histories as the only plausible butt of Li Chunfeng’s criticism.

⁷⁰ *Song shu*, 23.678.

⁷¹ *Sui shu*, 19.518.

⁷² *Sui shu*, 19.518. For more on this episode, see Morgan, “Sphere Confusion.”

floods occur and great armies arise. [If] uneven, horses are expensive. [If] Mars holds it, there is the establishment of a king. [If] a guest star enters it, fords are washed out.⁷³

In general, it is enough to read any one such catalog to know the genre, be it those contained in the “Tianwen zhi” (Table 1) or the great *tianwen* compendia from the sixth century on. Liu Zhiji’s frustration with the repetitiveness of the genre is particularly understandable here, but here again it works to our advantage.

Li Chunfeng monographs exhibit considerable overlap. Of the 24,909 characters of the *Book of Sui* catalog, 13,021 (52 percent) occur word-for-word in the *Book of Jin*; going the other way, 74 percent of the Jin catalog (16,613 graphs) occurs word-for-word in the *Book of Sui*. Eliminating the overlap, one finds that the most obvious point of divergence is that each contains whole subsections absent from the other, accounting for 8 percent of each.⁷⁴ There are also two common headings featuring different contents: “Yao xing” 妖星 (Freak Stars), and “Kexing” 客星 (Guest Stars), accounting for another 3087 graphs (12 percent) of the *Book of Sui*. The remaining 6825-graph difference (27.4 percent of the Sui catalog) is almost entirely a matter of excision/expansion, the *Book of Sui* featuring additional graphs, descriptions, explanations, and *zhan* formulae.⁷⁵ In short, one might say that we are dealing with two versions of the same text.

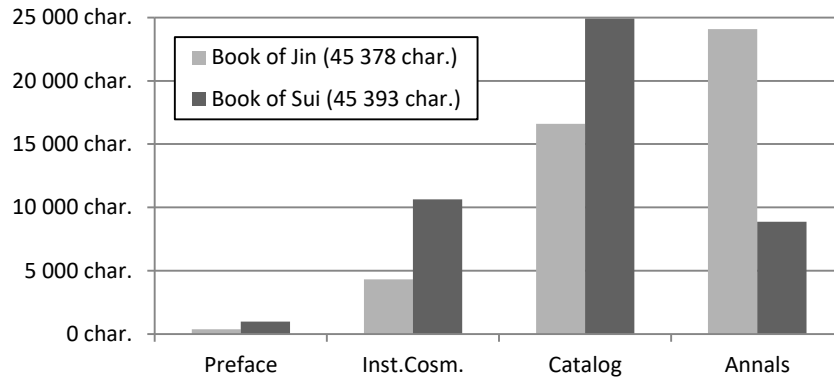
Given that Li Chunfeng cites “the *History of Jin*” in the *Book of Sui* (above), it would be easy to conclude that the Sui catalog was expanded from the former. It is also possible, however, that the two were either written at the same time or extracted from a single source. I say this because the *monographs* are almost identical in length—so identical that one wonders if Li Chunfeng was writing under a word-limit—it is just that they are weighted very differently between sections (see Graph 1). As such, it could well be the case that the *Book of Jin* catalog was *abridged* to make room for other contents. As to a common source, one notes that there is a considerable degree of overlap between Li Chunfeng’s monographs and the extant version of Yu Jicai’s 庾季才 (d. 603) omen compendia *Lingtai miyuan* 靈臺秘苑. The problem in establishing this as Li Chunfeng’s source, however, is that the *Lingtai miyuan* was heavily redacted and brought up to date in the Northern Song 北宋 (960–1127), reduced from 120 or 115 *juan* to 15, so it could well be the original⁷⁶ contents of Li Chunfeng that we see there in the extant version.

⁷³ *Sui shu*, 19.537.

⁷⁴ Absent from the *Book of Sui* are “Shier ci dushu” 十二次度數 (*Du*-numbers for the 12 Jovian Stations), “Zhou-jun chanci” 州郡躔次 (States and Provinces of the Step-Stations), and “Za xing qi” 雜星氣 (Misc. Stars and *Qi*) in 1258 graphs. Absent from the *Book of Jin* are “Tian zhan” 天占 (Heaven Omens), “Xing za bian” 星雜變 (Misc. Stellar Incidents), and “Za yao” 雜妖 (Misc. Freaks) in 1976 graphs.

⁷⁵ Note that these numbers exclude typical orthographic *variata* like 疎/疏, 稟/稟, 厨/廚, or 敍/敘. Note also that there are a handful of lines and paragraphs that are rearranged within the text of the two monographs that I count as overlap.

⁷⁶ See the preface to *Lingtai miyuan* in *Siku quanshu zongmu tiyao* 四庫全書總目提要.



Graph 1: Character distribution in Li Chunfeng's "Tianwen zhi"

The *Shiji* and *Book of Han* monographs exhibit a similar degree of overlap as Li Chunfeng's, but only the occasional line from the former actually appears in the latter. Li Chunfeng's break with the Sima-Ban complex is consistent with the disappointment he expresses towards the genre in his preface to the *Book of Sui* monograph. As always, it is up to a modern like him to do things better:

馬遷天官書及班氏所載，妖星暈珥，雲氣虹霓，存其大綱，未能備舉。自後史官，更無紀錄。春秋傳曰：「公既視朔遂登觀臺，凡分至啟閉，必書雲物。」神道司存，安可誣也！今略舉其形名占驗，次之「經星」之末云。

What [Si]ma Qian's "Heavenly Offices Monograph" and the Ban-clan put down about freak stars, haloes, clouds, and rainbows preserves an outline, but they were unable to see it through in full; and clerk-officials (historians) since then have made no record at all. The [Zuo] tradition of the *Spring and Autumn Annals* states that, "After the Duke had sighted the new moon, he ascended the observation terrace: at every equinox, solstice, opening, and closing, one must write down clouds and things" (Xi 5 [655 BCE]). How could we slander our duty to the *dao* of the spirits?! Here, I shall briefly enumerate their forms, names, omen-interpretations (*zhan*), and verifications (*yan*) and arrange these at the end of the "Canon Stars."⁷⁷

The introduction to his ten-*juan* omen compendium *Yisi zhan* gives us an idea of the sort of books that Li Chunfeng *does* take seriously:

淳風按：自『黃帝占』已後，向數十家，其間或真或偽，不可悉從。今略取其理當者，刪而次比，以著于篇。其間亦有出自經傳子史，但有關涉，理可存者，並不棄之。今錄古占書目於此，以表其人。自入占已後，並不復具記名氏，非敢隱之，并為是幼小所習誦，前後錯亂，恐失本真故耳。

Chunfeng notes: Since the *Huangdi zhan* 黃帝占, there have been in the past several tens of *jia* (lineage-experts/expert-lineages),

⁷⁷ *Sui shu*, 19.505. The tone of Li Chunfeng's preface to the *Book of Jin* "Heavenly Patterns Monograph" is more reserved: after enumerating previous entries in the genre, he informs us that "Here I shall detail the multitude of sayings (*shuo*) and written them into the current piece" 今詳眾說，以著于篇 (*Jin shu*, 11.278).

among which some are true (*zhen*) and some are fake (*wei*)—they cannot all/entirely be adhered to. At present, I shall summarily select those (lineages/contents) whose reasoning (*li*) is appropriate and, by deletion and enumeration, write them into the [present] piece. Among these, there are also those (contents) that derive from the classics, commentarial traditions, the masters, and the histories—so long as there is some relation, and its rationale is worthy of preservation/consideration, it shall absolutely not be discarded. At present, I shall record here a catalog of ancient omen-interpretation books so as to indicate the people (i.e. his sources). Once I enter into the omen-interpretations, I shall make no further note of their names. It is not at all that I dare to conceal [my sources], but rather for the simple reason that they are things that I have studied through recitation since my youth, and, having [doubtlessly] confused their sequence, I fear that I may lose their truth-in-authenticity (*ben zhen* 本真).⁷⁸

The *Yisi zhan* goes on to list twenty-five titles—all standard *tianwen* fare comprised of the eponymous omnia of legendary figures, weft texts, anonymous treatises, and collections by recent historical figures.⁷⁹

None of these sources are extant; fragments catalogued in Gautama Siddhārtha's 瞿曇悉達 *Kaiyuan zhanjing* 開元占經 (729) do however help us identify some of their contents. Not surprisingly, comparison reveals that Li's monographs draw heavily from the same sources as does his compendium. Take for example item three of seventeen under "Za yao" (Misc. Freaks) (circled numbers are added by the author):

三曰①蓬星，一名王星，狀如夜火之光，多即至四五，少即一二。亦曰，②蓬星在西南，修數丈，左右銳，出而易處。又曰，③有星，其色黃白，方不過三尺，名曰蓬星。又曰，④蓬星狀如粉絮，⑤見則天下道術士當有出者，布衣之士貴，天下太平，五穀成。又曰，⑥蓬星出北斗，諸侯有奪地，以地亡，有兵起。星所居者，期不出三年。又曰，⑦蓬星出太微中，天子立王。

Number three, it is said, is ① fluff stars, another name for which is king star. Their appearance is like the light of a night fire. They can be as numerous as four or five, or as few as one or two. It is also said that ② a fluff star is in the southwest, several *zhang* 丈

⁷⁸ *Yisi zhan*, 1.10b–11a; cf. Harper, "The Textual Form of Knowledge," 74.

⁷⁹ In order: (1) *Huangdi* 黃帝; (2) *Wuxian* 巫咸; (3) *Shi-shi* 石氏; (4) *Gan-shi* 甘氏; (5) Liu Xiang 劉向 (79–8 BCE), *Hongfan wuxing dazhuan* 洪範五行大傳; (6) *Wu jing-wei tu* 五經緯圖; (7) *Tianjing zhan* 天鏡占; (8) *Baihutong zhan* 白虎通占; (9) *Haizhong zhan* 海中占; (10) *Jing Fang* 京房 (77–37 BCE), *Yi yao zhan* 易祓占; (11) *Yi zhuan duiyi zhan* 易傳對異占; (12) *Chen Zhuo zhan* 陳卓占 (3rd cent.); (13) *Xi Meng zhan* 郟萌占 (1st cent.?).; (14) *Han Yang zhan* 韓楊占 (3rd cent.?).; (15) Zu Geng, *Tianwen lu zhan* 天文錄占; (16) Sun Senghua 孫僧化 (d. 538/539), *Daxiang ji zhan* 大象集占; (17) Liu Biao 劉表 (142–208), *Jingzhou zhan* 荊州占; (18) *Lie xiu zhan* 列宿占; (19) *Wu guan zhan* 五官占; (20) *Yi wei* 易緯; (21) *Chunqiu zuozhuqi zhan* 春秋佐助期占; (22) *Shangshu wei* 尚書緯; (23) *Shi wei* 詩緯; (24) *Li wei* 禮緯; and (25) Zhang Heng, *Lingxian*. Note that the 1932 manuscript copy of Li Feng's 李鳳 *Tianwen yaolu* 天文要錄 (664) held in the Naikaku bunko 內閣文庫 begins with a similar bibliography (reproduced in *Zhongguo kexue jishus dianji tonghui: tianwen juan*, vol. 4, 1.9b–11a).

in length,⁸⁰ pointed left and right, it emerges and changes places. It is furthermore said that ③ there is a star, its color being yellow-white, and [its length] no greater than three *zhang*, and it is called a fluff star. It is furthermore said that ④ a fluff star's appearance is like silk floss, and ⑤ if it appears, then there should be those who emerge from the ranks of the gentlemen of *dao* techniques (*daoshu shi* 道術士) of the subcelestial realm, cotton-clothes gentlemen (commoners) will be noble, the subcelestial realm will experience great peace, and the five grains will ripen. It is furthermore said that ⑥ [if] a fluff star emerges from the Northern Dipper, then marquises will seize land and, as land is lost, soldiers will be raised; and [the country corresponding to] the place where the star resides, its term shall not exceed three years. It is furthermore said that ⑦ [if] a fluff star emerges from within Privy Council (Taiwei 太微; Leo, Com, & Vir), the Son of Heaven will establish a king.⁸¹

Now, from the *Kaiyuan zhanjing*:

荆州占曰：①蓬星，一名王星，狀如夜火之光，多即至四五，少即一二。一曰②蓬星在西南，脩數丈，左右銳，出而易處。*Jingzhou zhan* 荆州占 says: ① “Fluff stars, another name for which is king star. Their appearance is like the light of a night fire. They can be as numerous as four or five, or as few as one or two. One [source] says that ② a fluff star is in the southwest, several *zhang* in length, pointed left and right, it emerges and changes places.”⁸²

聖洽符曰：有星，其色黃白，方不過三尺，名曰蓬星。見則天下道術士當有出者，布衣之士貴，天下太平，五穀成，人民寧期一年，遠二年。

Shengqia fu 聖洽符 says: ③ “There is a star, its color being yellow-white, and [its length] no greater than three *zhang*, and it is called a fluff star. ⑤ If it appears, then there should be those who emerge from the ranks of the gentlemen of *dao* techniques (*daoshu shi* 道術士) of the subcelestial realm, cotton-clothes gentlemen (commoners) will be noble, the subcelestial realm will experience great peace, and the five grains will ripen; the populace will be tranquil for a term of one year or, for the furthest, two years.”⁸³

黃帝曰...又曰：客星④狀如粉絮，拂拂然，名曰王蓬絮。見則其國兵起，若有喪、白衣會，其邦飢亡。

Huangdi says: ... “It is furthermore said that a guest star ④ whose appearance is like silk floss blowing in a gentle wind is called King Fluff Floss. If it appears, then soldiers are raised in its [corresponding] state; and if there is a death or a white-robe assembly (i.e., the death of the emperor), its state will perish of starvation.”⁸⁴

甘氏曰：⑥蓬星出北斗，諸侯有奪地，以地亡，有兵起，星所房者，期不出三年。

⁸⁰ On linear measures in observational records, see Wang Yumin, *Yi chi liang tian*.

⁸¹ *Sui shu*, 20.569–570.

⁸² *Kaiyuan zhanjing*, 86.11b.

⁸³ *Kaiyuan zhanjing*, 86.11b–12a.

⁸⁴ *Kaiyuan zhanjing*, 77.4a.

Mr. Gan says: ⑥ “[If] a fluff star emerges from the Northern Dipper, then marquises will seize land and, as land is lost, soldiers will be raised; and [the country corresponding to] the place where the star is housed, its term shall not exceed three years.”⁸⁵

郝萌曰：⑦蓬星出太微中，天子立王，期不出三年。
Xi Meng says: ⑦ “[If] a fluff star emerges from within Privy Council, the Son of Heaven will establish a king; the term shall not exceed three years.”⁸⁶

Since Li Chunfeng’s monograph catalogs are woven from the words of others, it is interesting to note what he marks off by *yue* 曰 “it is said”: anonymous attributions are mostly clustered around the rare and “freakish” phenomena at the catalog’s end. Li may not *name* his sources, but it would seem that he is just as careful about *delineating them* as he is about getting them right—delineating hearsay, one might say, from statements of authoritative fact.

Whatever his position on “freaks,” Li Chunfeng is clearly set upon bringing the monograph genre up to date with a contemporary knowledge. One sees further evidence of this as concerns planetary motion. Li reminds us that where the retrogradation of certain planets was once thought “anomalous” (*yi* 異), “it was learned after observations in the early Han that *all* the [planets] experience retrogradation” 漢初測候，乃知五星皆有逆行。⁸⁷ In that vein, he goes on to recount how, more recently, Zhang Zixin 張子信 (fl. 526–576) “awoke” (*wu* 悟) to the fact that the variability of their motions and visibility was “regular” (*chang* 常) too. Tellingly, *zhan* formulae concerning phenomena such as these are not to be found in Li Chunfeng’s monographs or *Yisi zhan*.⁸⁸

Li also brings the monograph catalog genre up to date in terms of structure. The fifteen section headings of Li Chunfeng’s Sui catalog (and the sixteen of his Jin catalog) reveal a significant refinement over his predecessors’ taxonomies, bringing his monograph into line with those one sees in seventh- and eighth-century omen compendia. Li’s catalog provides a subdivision of anomalous “stars,” for example, and it segregates halos, perihelia, and so on from regular luminary lore. Due to the fragmentary state of early texts, it is difficult to tell when this trend began in professional literature, but we see its influence as early as Xiao Zixian’s 蕭子顯 (489–537) *Book of Southern Qi*.

The Annals

The topic of *tianwen* theory leads naturally into the topic of *tianwen* practice, which we find on display in the forebodingly titled section “Wudai zai bian ying” 五代災變應 (Five Dynasties Disaster-incidents and their Responses). This section is divided

⁸⁵ *Kaiyuan zhanjing*, 86.12a.

⁸⁶ *Kaiyuan zhanjing*, 86.12a.

⁸⁷ *Sui shu*, 20.561.

⁸⁸ On the fate of early omenological planetary models under the scrutiny of later *li* experts, including Li Chunfeng, see Morgan, “Mercury and the Case for Plural Planetary Traditions.”

into separate annals for the Liang 梁 (502–557), Chen 陳 (557–589), Wei 魏 (Northern: 386–535; and Eastern: 534–550), Northern Qi 北齊 (550–577), Northern Zhou 北周 (557–581), and Sui. Each annals is subdivided year-by-year into paragraphs recording the date, omen-reading (*zhan*), and/or correspondent event (*ying* 應) of the observed phenomena. For year six of the Chen Tianjia era (560–566), for example, we have the following paragraph (circled numbers added by the author):

①六年正月己亥，太白犯熒惑，相去二寸。占曰：「其野有兵喪，改立侯王。」②三月丁卯，日入後，眾星未見，有流星白色，大如斗，從太微間南行，尾長尺餘。占曰：「有兵與喪。」③四月丁巳，月犯軒轅。占曰：「女主有憂。」④五月丁亥，太白犯軒轅。占曰：「女主失勢。」又曰：「四方禍起。」其後年，少帝廢，廢後慈訓太后崩。⑤六月己未，月犯氐。⑥辛酉，有彗長可丈餘。占曰：「陰謀竊起。」一曰：「宮中火起。」後安成王錄尚書、都督中外諸軍事，廢少帝而自立，陰謀之應。⑦八月戊辰，月掩畢大星。⑧丙子，月與太白並，光芒相着，在太微西蕃南三尺所。⑨九月辛巳，熒惑犯左執法。⑩癸未，太白犯右執法。⑪辛卯，犯左執法。⑫乙巳，月犯上相，⑬太白犯熒惑。⑭其夜，月又犯太白。占曰：「其國內外有兵喪，改立侯王。」明年，帝崩，又少帝廢之應也。

① 6-I-*jihai*.³⁶ (565 Mar 03): Venus trespassed upon Mars, distance 2 *cun* (0.2 *du*). Omen interpretation states: “In its field there are soldiers, death, and the installment of a new marquis or king.”
 ② III-*dingmao*.⁰⁴ (sic.).⁸⁹ After sun had set, and before the stars had appeared, there was a flowing star, which was white in color, as large as a *dou* measure,⁹⁰ and travelling from the south of Privy Council with a tail more than one *chi* (1 *du*) long. Omen interpretation states: “There are soldiers and death.”
 ③ IV-*dingsi*.⁵⁴ (May 20): Moon trespassed upon Xuanyuan 軒轅 (Leo). Omen interpretation states: “The female chief has worries.”
 ④ V-*dinghai*.²⁴ (Jun 19): Venus trespassed upon Xuanyuan. Omen interpretation states: “The female chief falls from power”; another: “Disaster ignites the four directions.” The year after next, Shaodi 少帝 (r. 566–568) was deposed, and after being dethroned, Empress Dowager Cixun 慈訓 (Zhang Yao'er 章要兒; 506–570) passed away.
 ⑤ VI-*jiwei*.⁵⁶ (Jul 21): Moon trespassed upon Root.^{L03} (α,β,γ,ι Lib).
 ⑥ *Xinyou*.⁵⁸ (Jul 23): there was a broom star more than one *zhang* (10 *du*) long. Omen interpretation states: “Plotting and evildoers arise”; another: “Fire ignites in the palace.” Later, the King of Ancheng 安成 (Chen Xu 陳頊 [530–582]) took charge of the masters of writing and the inner and outer armies of the commander-in-chief, deposed Shaodi and enthroned himself—this was a response to “plotting.”
 ⑦ VIII-*wuchen*.⁰⁵ (Sep 28): Moon concealed the big star in Net.^{L19} (α,θ,γ,ε,δ,λ Tau).
 ⑧ *Bingzi*.¹³ (Oct 06): Moon and Venus conjoined, their rays of light touching one another, at a spot three *chi* (3 *du*) south of Privy Council’s western wall (Leo).
 ⑨ IX-*xinsi*.¹⁸ (Oct 11): Mars trespassed upon Left Law Administrator (Zuo zhifa 左執法; η Vir).
 ⑩ *Guiwei*.²⁰ (Oct 13): Venus tres-

⁸⁹ There is a problem with this one date according to Zhang Peiyu, *Sanqi-anwubai nian liri tianxiang*, which has month III of this year begin on day *guiwei*.²⁰ (Apr 16), placing day *dingmao*.⁰⁴ in either month II (Mar 31) or month IV (May 30), of which the order of observations here would favor the former.

⁹⁰ On descriptions of celestial objects being “as large as *x*,” see Wang Yumin, *Yi chi liang tian*, 8–9, 103–105.

passed upon Right Law Administrator (You zhifa 右執法; β Vir).⁹¹ ⑪ *Xinmao*.²⁸ (Oct 21): trespassed upon Left Law Administrator. ⑫ *Yisi*.⁴² (Nov 04): Moon trespassed upon Upper Minister (Shangxiang 上相; γ Vir); ⑬ Venus trespassed upon Mars. ⑭ That night: Moon again trespassed upon Venus. Omen interpretation states: “Its [corresponding] kingdom has soldiers and death inside and out, and the installment of a new marquis or king.” The next year, the emperor died, but this was also a response to Shaodi’s dethronement.⁹²

Teasing a story from this sort of text requires quantitative analysis. To this end, I have entered the contents of this and previous monographs’ annals into a spreadsheet, taking care to enumerate individual phenomena in connection with appended interpretations and correspondences.⁹³ By my analysis, the *Book of Sui* annals reports 293 distinct phenomena between the years 502 to 617. By way of dynasty, in Table 3, we see that the Zhou and Chen are disproportionately well-documented in terms of both number and number-per-year. By way of phenomena-type, as defined by *Book of Sui* monograph’s catalog of astral lore, we find in Graph 2 that the vast majority of reports concern the seven luminaries (237 items, or 82 percent), and we find in Graph 3 that the vast majority of *these* concern the five planets (207 items, or 71.7 percent). In Table 4, we see that luminary records break down within the standard repertoire of phenomena described in omen literature.⁹⁴ What are evidently comets, shooting stars, and atmospheric phenomena make up most of the remaining 18 percent. By way of omen-reading, we find in Graph 4 that roughly a third of the items bear no explicit omenological significance. In Graphs 2–4, I provide also the situation of the *Book of Han* by means of comparison.

Now that we have a feel for the contents, format, and emphases of these annals, it behooves us to think critically about what we are looking at. What we are looking at is foremost the product of one man’s active collation and selection. What were Li Chunfeng’s sources? He does not tell us, nor do originals survive. We can, however, make an educated guess that he was working from records kept by the respective states’ Clerk’s Office (*shiguan* 史官). One of the Clerk’s Office’s age-old tasks was operating a Numinous Terrace (*lingtai* 靈台) observatory in the capital to observe and interpret such phenomena, a record of which, in conjunction

⁹¹ Note that Venus passed within less than half a degree of β Vir on the following day, *jiashen*.³¹ or 565 Oct 14.

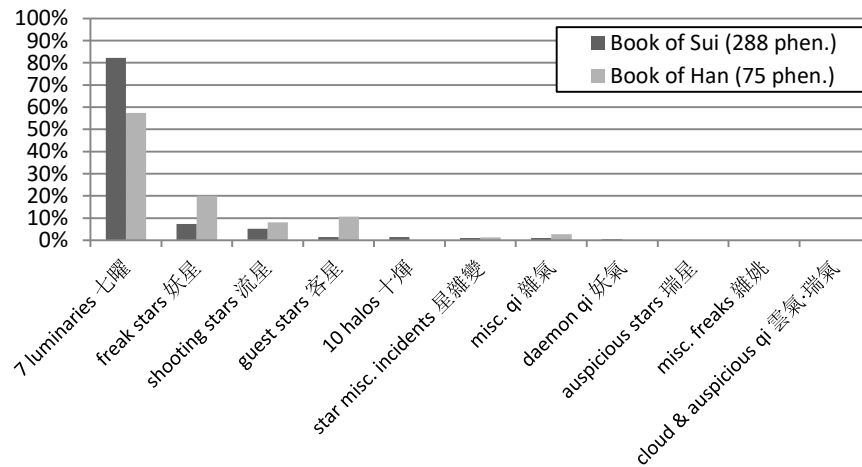
⁹² *Sui shu*, 21.598.

⁹³ In this paragraph, for example, I identify 14 phenomena, 6 omen-interpretations, and 3 correspondent events. In my accounting, “an omen-interpretation” is one or more *zhan* statements following a single phenomenon, and I count a single correspondent event as attached to the preceding phenomena *as well as* any phenomena bearing a *zhan* statement relevant to the situation. For example: item ⑤ counts as uninterpreted; item ④ counts as one “omen-interpretation,” i.e. one interpreted phenomena; and the dethronement of Shaodi and death of the empress dowager count as a single event corresponding to the phenomena ①②③④.

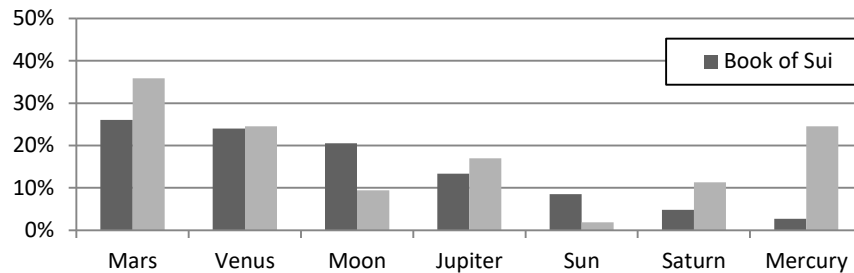
⁹⁴ For definitions of the terms found in Table 4, see Ho Peng Yoke, *The Astronomical Chapters of the Chin Shu*, 20–21, 31–41; Zhuang Weifeng, *Zhongguo gudai tianxiang jilu de yanjiu yu yingyong*, 122–123, 128–131.

Dynasty	Reign (years)	Phen. observed	Phen./year
Zhou	25	106	4.24
Chen	33	91	2.76
Qi	28	29	1.04
Sui	38	28	0.74
Liang	56	37	0.66
Wei*		2	

Table 3: Distribution of *Book of Sui* annals phenomena by dynasty



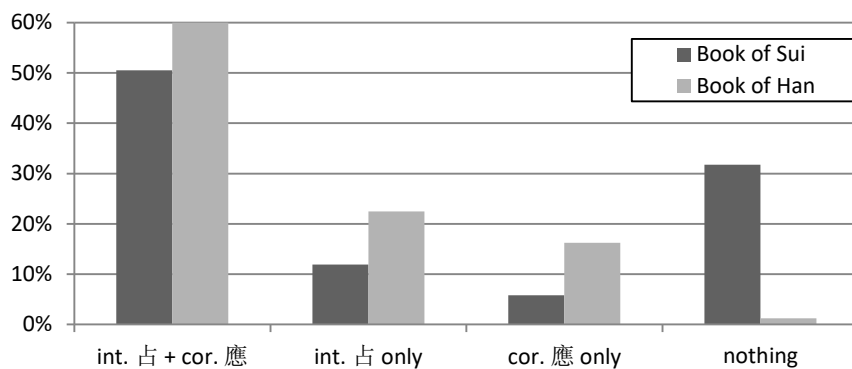
Graph 2: Distribution of observed phenomena



Graph 3: Distribution of luminary phenomena (includes multi-luminary events)

Term	Definition	Number
<i>Fan</i> 犯	“to trespass upon,” to pass within 1° of another object.	106
<i>Shi</i> 食	(1) “to be eaten,” i.e. eclipsed (sun & moon only); (2) “to eat,” i.e. to occult another object (sun & moon only).	18 7
<i>Ru</i> 入	“to enter into” (the moon or an asterism).	22
<i>He</i> 合	“to align,” to co-occupy a single lodge (two to three luminaries).	19
<i>Yan</i> 掩	“to conceal,” to occult (a star or planet)	16
<i>Shou</i> 守	“to hold,” to linger in station in the vicinity of (planets only)	12
<i>Zhouxian</i> 晝見	“to appear in daylight”	10
–	misc. haloes & atmospheric phenomena	10
<i>Bing</i> 并	“to conjoin” or touch another object	4
<i>Zai</i> 在	“to be in” a particular asterism	4
<i>Ju</i> 聚	“to amass” in a single lodge (three or more luminaries)	3
–	misc. changes in brightness & color	3
<i>Shixing</i> 失行	“to go off course” in terms of expected time, position, or behavior (planets)	2
<i>Jingtian</i> 經天	“to cross heaven” from east to west, usually in daylight	1

Table 4: Luminary omina



Graph 4: Distribution of omen interpretations (int) and correspondent events (cor)

with news of omnia from beyond the capital, the main office was charged with keeping.⁹⁵ The *Book of Sui* bibliographic monograph records just such a resource—a *Taishi zhuji* 太史注記 (The Grand Clerk’s Note Records) in six *juan*, filed under “Heavenly Patterns”—and we see practitioners of *li* both inside and outside the Clerk’s Office noted as working from similarly-titled materials in lieu of personal observation.⁹⁶ The reason for believing that Li compiled his annals from such sources is simple: the vast number of phenomena contained therein that are calculable only by later procedures and that stand up to modern analysis.⁹⁷ The fact that Li Chunfeng was able to rummage up astronomical records from eleven courts (six here, five for the *Book of Jin*) over four war-torn centuries would seem to speak to the long-term value and circulation of such materials.

We cannot know how representative our sample is of the *tianwen* activities of the Five Dynasties courts; knowing that our sample derives from those activities, however, does allow us to reflect upon both what contemporary observers were looking at and what they saw. First, the Chinese astral sciences are often accused of a, in Nakayama Shigeru’s 中山茂 words, “lack of concern with planetary motions.”⁹⁸ Nathan Sivin tells us that:

The political priority of eclipses kept planetary phenomena peripheral, no matter how technically interesting they were. Astronomers recognized that the motions of the five classical planets were very different from each other, but coming to grips with those differences would have required sustained, precise measurement over a number of years. That would have entailed new government priorities, additional time, and more money.⁹⁹

Nakayama and Sivin’s claims are based on impressions of the relative complexity and rate of development of planetary vs. eclipse models as seen in *li* procedure texts. Were we to form an impression *de novo* from observational sources, we might conclude instead that the Chinese were *obsessed* with the planets, Mars and

⁹⁵ On the state astronomical office, see Deane, “The Chinese Imperial Astronomical Bureau”; Chen Xiaozhong and Zhang Shuli, *Zhongguo gudai tianwen jigou yu tianwen jiaoyu*.

⁹⁶ Namely, *shiji* 史記 “Clerk’s records,” *shiguan houzhu* 史官候注 “shiguan observation notes,” *xingshi houzhu* 行事候注 “observation notes of past events,” *zhuji* 注記 “note records,” *jishu* 記注 “annotated records,” and, simply, *zhu* 注 “notes”; see *Hou Han shu*, *zhi* 2, 3027, 3029, 3030, 3034, 3039, 3041, 3042; *Song shu*, 12.290, 13.309, 311, 312, 315; *Jin shu*, 17.498, 18.564; *Sui shu*, 18.460.

⁹⁷ Predicting phenomena like “trespassing,” “concealing,” and “holding” requires both a degree of accuracy and a mastery of planetary latitude and retrogradation the seventh-century expert lacked. With that in mind, it is significant that astronomical software like *Alcyone Ephemeris 3.2* is able to confirm that, for example, *all* the luminary phenomena reported in the previously quoted paragraph for 565 (nos. 1, 3, 4, 5, 7–14) occurred as described. For studies dealing with broader samples, see Wu Shouxian and Liu Ciyuan, “28 xiu juxing”; Stephenson, *Historical Eclipses*, 213–333; Steele, *Observations and Predictions of Eclipse Times*, 161–215; Zhuang Weifeng, *Zhongguo gudai tianxiang jilu de yanjiu yu yingyong*, 375–406.

⁹⁸ *A History of Japanese Astronomy*, 150.

⁹⁹ *Granting the Seasons*, 32–33.

Venus in particular. Not only do planetary phenomena occupy 70.7 percent of the *Book of Sui*'s reports, they are interpreted just as frequently as are luni-solar phenomena: 51 percent (110 of 195) purely planetary phenomena bear some combination of interpretation and correspondent event compared to 55 percent (40 of 73) of purely luni-solar phenomena. Extant omen compendia witness a similarly disproportionate interest in the planets. In terms of the ratio of planetary to luni-solar content for example, Li Chunfeng's *Yisi zhan* comes in at 18:11 (sections), Li Feng's 李鳳 *Tianwen yaolu* 天文要錄 (664) at 5:4 (*juan*), and Gautama's *Kaiyuan zhanjing* at 42:13 (*juan*).¹⁰⁰

Also noteworthy is that, despite what the title may suggest, the phenomena reported in “Five Dynasties Disaster-incidents and their Responses” are mostly quite banal. The majority of reports concern the positions, motions, and configurations of the sun, moon, and planets; most of the rest concern rare but unexceptional matters of cometary and atmospheric phenomena, shooting stars, sunspots, and clouds. In other words, there is little that stands out as inconceivable from the perspective of modern or contemporary classifications. Everything has a name, nothing baffles Li Chunfeng's observer. Heavenly patterns literature seems to have provided observers with such comprehensive catalogs and classificatory schemes by this time that the sky had little to offer them by way of surprise. However supposedly different the ancient mind, or enchanted the ancient world, state employees neither expect nor report the appearance of gods, dragons, spacecraft, or the like before their instruments.

The reports are believable, but they are not always reliable, which brings us back to the question of authorship. In Huang Yilong's 黃一農 study on “Mars holding Heart.L05 (σ, α, τ Sco)” and five-planet massings, he has shown that records of the most politically significant omnia exhibit rampant tampering and fabrication.¹⁰¹ Concerning massings, for example, he concludes that “the majority are not actual observational records but, more likely, omnia concocted by later men to prove theories about the Mandate of Heaven.”¹⁰² When we focus on the annals of a single monograph, however, the situation seems less dire. The *Book of Sui* monograph records two instances of Mars holding Heart.L05: one on 549 Mar 10 and another on 549 May 03. This two-month span does roughly correspond with the planet's retrogradation and second station in Heart.L05, but the dates are peculiar and the determination of two separate “holdings” seems problematic (Figure 5). The *Book of Sui* records three instances of planetary massings: 531 Oct 26- (♃♁♂♀ in Beak.L20 and Triad.L21 [Ori]), 578 Jul 21 (♂♀♃ in Well.L22 [Gem]), and 579 Jun 09 (♀♃♁ in Well.L22). The massings of 578 and 579 check out; by coincidence, however, it is the one massing that bears interpretation and verification that is completely made up—that “it is time that a king should arise” 當

¹⁰⁰ On the importance of planetary omens, see also Pankenier, *Astrology and Cosmology*.

¹⁰¹ *Shehui tianwenxue shi shi jiang*, 1–71.

¹⁰² *Shehui tianwenxue shi shi jiang*, 71.

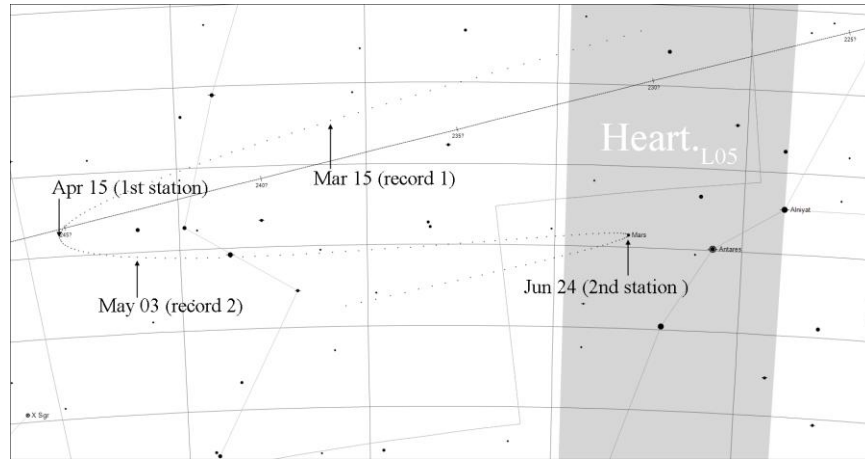


Figure 1: Mars holding Heart-L₀₅ in 549. Image modified from *Alcyone Ephemeris* v3.2.

有王者興 in Qi in 531.¹⁰³ As we turn to less significant phenomena, however, the rate of fabrication seems to drop off.¹⁰⁴ The one exception to this is solar eclipses, the reason being that reports include (without distinction) both observations and predictions (6:10 in the case of the *Book of Sui*), but this might speak to a differences in our actors' definition of "observation."¹⁰⁵ Interestingly, none of the predicted eclipses in the *Book of Sui* are attributed omenological significance.

Observations can be reliably traced back to Five Dynasties actors, but *zhan* omen-interpretations are another matter. First of all, they are so invariably prescient vis-à-vis stated verifications as to smack of manipulation. The question is not *whether* they are manipulated but *by whom* and *for what purpose*. Early debate on this topic focused on the question of censorship among ministers at the Han court, treating the reportage and interpretation of heavenly phenomena as direct expressions of ministerial defiance.¹⁰⁶ Martin Kern has significantly complicated the matter, pointing to heterogeneous interpretations of single reports in the *Shiji* and *Book of Han* as chronological layers of *a process* by which the meaning and verification of omnia were negotiated and settled upon over time.¹⁰⁷ It is of course the compiler-historian who lies at the end of

¹⁰³ *Sui shu*, 21.600. According to *Alycone Ephemeris* 3.2, on 531 Oct 26, the planets were quite distant from one another—Venus at 261° longitude, Mars at 157°, Jupiter at 112°, and Saturn at 96°—and Orion (α Ori being at 68°).

¹⁰⁴ See Note 97.

¹⁰⁵ On the inclusion of predicted but unobserved/unobservable eclipses in monograph annals, see Foley, "A Statistical Study of the Solar Eclipses Recorded in Chinese and Korean History." The *Book of Sui*, for example, records eclipses for (1) 512 Jan 04, (2) 559 Jun 20, (3) 561 Oct 25, (4) 563 Apr 09, (5) 564 Feb 28, (6) 564 Aug 23, (7) 565 Aug 12, (8) 566 Feb 06, (9) 567 Jan 26, and (10) 567 Dec 17 that correspond to historical eclipses that would not have been visible in East Asia according to Espenak and Meeus, *Five Millennium Canon of Solar Eclipses*. Note that the eclipse discussed in the next sentence is not included in the ratio 6:9. Also excluded for consideration are seven cases of the sun and moon *shi* "eating" other objects (see Table 3).

¹⁰⁶ See Note 6.

¹⁰⁷ Kern, "Religious Anxiety."

that process, selecting and weaving together sources into a comprehensible narrative of an empire. The historian's interest in canonizing historical omens cannot be underestimated, since, as Mark Kalinowski has shown for the *Zuo Tradition*, “outre leurs fonctions proprement prédictives, ces récits jouent un rôle actif dans la narration, tel que de porter un jugement sur une personne, de légitimer une action ou de susciter un débat sur les pratiques des devins.”¹⁰⁸

Wei Shou 魏收 (506–572) says as much in his preface to the *Book of Wei* monograph, explaining how he both worked with and worked over historical omen reports:

今以在天諸異咸入天象，其應徵符合，隨而條載，無所顯驗則闕之云。

Here we place all the various anomalies in heaven into the “Heavenly Signs” [monograph]. Those whose correspondence with evidence are in accordance are followed and recorded line-by-line, while those without manifest verifications have been excised.

The difficulty with attributing the sort of *zhan* statements we see in heavenly patterns monographs is that they are anonymous: all we are told is *zhan yue* 占曰 “omen-interpretation states.” The one exception is Shen Yue's monograph, which alternates between *zhan yue* and *an zhan* 按占 “according to omen-interpretation,” the latter reading like an author's note (see above). That *an zhan* may distinguish the voice of the compiler from that of his sources is further suggested by the fact that *an zhan* tends to introduce longer, more scholastic explanations of phenomena:

嘉平三年十一（二）月癸未，有星孛于營室，西行積九十日滅。占曰：「有兵喪。室為後宮，後宮且有亂。」四年二月丁酉，彗星見西方，在胃，長五六丈，色白，芒南指貫參，積二十日滅。五年十一月，彗星又見軫，長五丈，在太微左執法西，東南指，積百九十日滅。按占，「胃，兗州之分，參白虎主兵，太微天子廷，執法為執政，孛彗為兵，除舊布新之象。」正元元年二月，李豐、豐弟兗州刺史翼、后父光祿大夫張緝等謀亂，皆誅，皇后亦廢。九月，帝廢為齊王，高貴鄉公代立。

Jiaping 3-(XII)-*guiwei*.²⁰ (251 Dec 31): there was a star that luxuriated in Hall._{L13} (Yingshi 營室; $\alpha, \beta, \gamma, \delta$ Peg) and traveled west for a total of 90 days before extinguishing. **Omen interpretation states:** “There are soldiers and death; Hall._{L13} is the rear palace: the rear palace is also in chaos.” 4-II-*dingyou*.³⁴ (252 Mar 24): a broom star appeared in the west. It was in Stomach._{L17} (Wei 胃; ϵ, θ Peg, α, o Aqr), five or six *zhang* long, white in color, its rays pointing south and piercing Triad._{L21} (Shen 參; Ori) for a total of 20 days before extinguishing. 5-XI (253 Dec 8 – Jan 05), a broom star again appeared in Baseboard._{L28} (Zhen 軫; $\beta, \delta, \gamma, \epsilon$ Crv), five *zhang* long, to the west of the Left Law Administrator of Privy Council it pointed southeast for a total of 90 days before extinguishing. **According to omen interpretation**, Stomach._{L17} is the [field] allocation of Yanzhou. Triad._{L21}, in the White Tiger, governs soldiers. Privy Council is the court of the Son of Heaven. Law Administrators are administrators. Luxuriating and broom [stars]

¹⁰⁸ Kalinowski, “La rhétorique oraculaire,” 38.

are soldiers, which are symbols of out with the old and in the new. Zhengyuan 1-II, Li Feng 李豐, Feng's younger brother Inspector of Yanzhou, [Li] Yi 翼, and their stepfather Imperial Household Grandee Zhang Ji 張緝, et al. plotted rebellion; they were all punished and the empress was deposed. In month IX, the emperor was dethroned to serve as the king of Qi, and the Duke of Gaogui Township 高貴鄉 took his place.¹⁰⁹

Whether or not simple *zhan* statements were original to *shiguan* records—and were thus *selected* rather than *authored* by the historian—the elegance with which the phenomena, their significance, and their correspondence with major political events all tie together is clearly the conscious effort of someone writing in hindsight. This is particularly true of the early monographs, where it is very much the phenomena that are embedded in historical accounts rather than *vice versa*; and it true too of the *Book of Jin* and *Book of Song*.

What stands out about the *Book of Sui* annals then is the relative absence (or abstinence) of the organizing hand: we find snippets of history embedded in observational records, 45 percent of which bear no correspondent event (Graph 4). Comparison of the year-entries quoted above gives one a sense of this contrast, but nowhere is this more apparent than in naked year-entries like the following:

天和元年正月己卯，日有食之。十月乙卯，太白晝見，經天。
[Zhou] Tianhe 1-I-*jimao*.¹⁶ (566 Feb 06): the sun was eclipsed. X-*yimao*.⁵² (Nov 08): Venus appeared in daylight and crossed heaven.¹¹⁰

It is unclear why Li Chunfeng presents the *Book of Sui* annals the way he does—whether for love of data, lack of time, or political sensitivity—but his interpretative abstinence is as much a choice as is his active shaping of sources. This choice harkens back to the *Book of Southern Qi*, whose annals is almost completely bare of interpretation, and it adumbrates what will come of the *tianwen* monograph genre.¹¹¹

Conclusion

The “Heavenly Patterns Monograph,” as a genre, is an anonymous patchwork of disparate things, many of them recycled from one monograph to the next. For all they share, it is easy to hop between them, picking and choosing, as we write our modern histories of whatever subject it may be. And this works, for the most part, but

¹⁰⁹ *Song shu*, 23.689.

¹¹⁰ *Sui shu*, 21.604.

¹¹¹ The reason that Xiao Zixian cites for the omenological bareness of the *Book of Southern Qi*'s annals is that “Mingdi (r. 494–498) did not desire to have heavenly incidents leak to the outside, so he made them all secret and they did not emerge” 明帝不欲使天變外傳，竝祕而不出 (*Nan Qi shu*, 12.205). Other compilers, however, do not cite this reason, and the number of omen-interpretations in such annals begins to fall off rapidly in the Tang and later.

it is important to remember that each of these patchworks was at one point woven together by a different hand—pieces are missing, pieces are added, and all of this for a reason. Looking at the *Book of Sui*, and by way of comparison with the *Book of Jin*, we get a clear sense of how one hand acted to shape this anonymous patchwork to personal ends. Li Chunfeng does many things that we might expect: he deliberates on conflicting sources, and he brings the reader up to date with history and current knowledge, be it cutting-edge instruments or ancient oracles. He does other things we might not expect—like contradict himself—but the greatest surprise for the twenty-first-century reader is probably the historical vision that he imposes upon his sources. Li Chunfeng is *skeptical* about his predecessors and even the sages, offering empirical evidence of how we now know better: we know that the armillary sphere looted from Chang’an was Xiongnu, and we know that astronomers there like Jiang Ji did things with it about which Confucius had never dreamed. This vision is fundamentally different from his immediate predecessors in this genre, and it might explain the vindictiveness with which he approached their work.

Li Chunfeng did not just *steal* from Shen Yue, and He Cheng-tian before him—he *buried them*. In working *every word* of his predecessors’ writing into his own bigger and better monographs he essentially made the former obsolete. He may not have done right by Shen and He, but he did well enough by his “duty to the *dao* of the spirits” as a historian (above) to establish his version as authoritative. Li Chunfeng’s star catalog, as previously mentioned, is similar in content to the Northern Song redaction of the *Lingtai miyuan* (6th cent.). Whatever the relation between them, and whatever *other sources* were available, it is Li Chunfeng’s *Book of Sui* and *Jin* catalogs that later scholars consistently cite for facts about the sky, be it Wang Yinglin’s 王應麟 (1223–1296) *Yuhai* 玉海, the *Wenxian tongkao* 文獻通考 (1307), or the later *History of Song* (1346). Not only did these facts now *belong* to Li Chunfeng, so too did the very genre, as it is his four-part “Tianwen zhi” that became the model for future monographs to come (see Table 1). Plagiarism, if done right, apparently pays off.

We might well dismiss this as a curious footnote on our sources—Li is just a compiler of yet other sources after all—but the way that these sources are compiled matters to our understanding of what they mean. One of the places where Li Chunfeng’s influence is felt the deepest, for example, is in the history of “heaven’s form” cosmology. Three monographs tell that history, and they tell it the same way—THREE SCHOOLS, ONE WINNER—and *this* but for a handful of exceptions is how we continue to tell it in the twenty-first century. It should behoove us to know then that all three are actually the same source: one written by a “regressivist” and then split and turned against him in the name of “progress.” We should furthermore know that the author of the latter two is *the same man*, and that he is a man who contradicts himself on this very point and elsewhere numbers the “schools” as eight. It is through this man’s eyes, this man’s ambitions, and this man’s grudges that we are seeing the history of heavenly patterns in the *Book of Sui* and *Jin*, and we should ask if they may not be coloring what we read.

Abstract: The “Tianwen zhi” 天文志 (Heavenly Patterns Monograph) is a repetitive and fractured genre. Much of the contents from one monograph to another are the same, and the division of the monograph’s typical division into a history, a star catalogue, and an annals of observed phenomena make it difficult to read as a whole. To approach the question of Li Chunfeng’s 李淳風 (602–670) hand in shaping the *Book of Sui* “Tianwen zhi,” this study avails itself to collation. Isolating what contents Li’s *Book of Sui* monograph shares word for word with the *Book of Jin*, *Song*, and *Han*, I focus on the handful of passages that Li Chunfeng has added, excised, and rearranged on the basis of his sources. In doing so, several patterns emerge, the most notable among them being that Li has taken Shen Yue’s 沈約 (441–513) regressivist history of “heaven’s form” (*tianti* 天體) cosmology in the *Book of Song* and rearranged it, without acknowledgement, into a progressivist argument against its author. This and other evidence of Li Chunfeng’s editorial hand serves as a reminder of how what we often treat as a reference work should be read more carefully as a piece of historiographical argumentation.

Keywords: astronomical instruments, cosmology, observational records, omenology, star catalogs, Li Chunfeng

Bibliography

Pre-1850 Texts and Epigraphic Sources, by Titles

- Han shu* 漢書. Ban Gu 班固 et al. Beijing: Zhonghua shuju, 1962 (8 vols.).
- Hou Han shu* 後漢書. Fan Ye 范曄 et al. Beijing: Zhonghua shuju, 1965 (12 vols.).
- Jin shu* 晉書. Fang Xuanling 房玄齡 et al. Beijing: Zhonghua shuju, 1974 (10 vols.).
- Jiu Tang shu* 舊唐書. Liu Xu 劉昫. Beijing: Zhonghua shuju, 1975 (16 vols.).
- Kaiyuan zhanjing* 開元占經. Gautama Siddhārtha 瞿曇悉達. Reprint from Wenyuange Siku quanshu 文淵閣四庫全書, 1782; edition Taipei: Taiwan shangwu yinshuguan, 1983–1986.
- Nan Qi shu* 南齊書. Xiao Zixian 蕭子顯. Beijing: Zhonghua shuju, 1972 (3 vols.).
- Shiji* 史記. Sima Qian 司馬遷 (c. 146 – c. 86 BCE) et al. Beijing: Zhonghua shuju, 1959 (10 vols.).
- Song shi* 宋史. Tuotuo 脫脫 et al. Beijing: Zhonghua shuju, 1977 (40 vols.).
- Song shu* 宋書. Shen Yue 沈約. Beijing: Zhonghua shuju, 1974 (8 vols.).
- Sui shu* 隋書. Wei Zheng 魏徵, Linghu Defen 令狐德棻, et al. Beijing: Zhonghua shuju, 1973 (3 vols.).
- Yisi zhan* 乙巳占. Li Chunfeng 李淳風. Reprint from Shiwan juan lou congshu 十萬卷樓叢書 in ed. *Zhongguo kexue jishu dianji tonghui: tianwen juan* 中國科學技術典籍通彙·天文卷, ed. Bo Shuren 薄樹人, vol. 4, 451–599 (Zhengzhou: Hebei jiaoyu chubanshe, 1993).
- Yiwen leiju* 藝文類聚. Ouyang Xun 歐陽詢. Reprint from Wenyuange Siku quanshu 文淵閣四庫全書, 1782; edition Taipei: Taiwan shangwu yinshuguan, 1983–1986.
- Yuhai* 玉海. Wang Yinglin 王應麟. Reprint from Wenyuange Siku quanshu 文淵閣四庫全書, 1782; edition Taipei: Taiwan shangwu yinshuguan, 1983–1986.
- Zhoubi suanjing* 周髀算經. Reprint from Wenyuange Siku quanshu 文淵閣四庫全書, 1782; edition Taipei: Taiwan shangwu yinshuguan, 1983–1986.
- Zhuangzi zhu* 莊子注. Reprint from Wenyuange Siku quanshu 文淵閣四庫全書, 1782; edition Taipei: Taiwan shangwu yinshuguan, 1983–1986.

Secondary Works, by authors

- Arai Shinji 新井晉司. “Chō Kō Kontengi, Kontengi-chū saikō” 張衡『渾天儀』『渾天儀注』再考. In *Chugoku kodai kagakushi*

- ron 中國古代科學史論, edited by Yamada Keiji 山田慶兒, 317–336. Kyōto: Kyōto daigaku jinbun kagaku kenkyūjo, 1989.
- Beer, A., Ho Ping-Yü, Lu Gwei-Djen, Joseph Needham, E.G. Pulleyblank, and G.I. Thompson. “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.
- Bielenstein, Hans. “An Interpretation of the Portents in the *Ts’ien-Han-Shu*.” *Bulletin of the Museum of Far Eastern Antiquities* 22 (1950): 127–43.
- . “Han Portents and Prognostications.” *Bulletin of the Museum of Far Eastern Antiquities* 56 (1984): 97–112.
- Bielenstein, Hans, and Nathan Sivin. “Further Comments on the Use of Statistics in the Study of Han Dynasty Portents.” *Journal of the American Oriental Society* 97, no. 2 (1977): 185–187.
- Chavannes, Édouard. *Les Mémoires historiques de Se-ma Ts’ien*. Vol. 3. Paris: Librairie d’Amérique et d’Orient, 1967.
- Chen Jiujin 陳久金. “Zhang Heng de tianwenxue sixiang” 張衡的天文學思想. *Keji shi wenji* 科技史文集 6 (1980): 23–31.
- Chen Meidong 陳美東. *Zhongguo gudai tianwenxue sixiang* 中國古代天文學思想. *Zhongguo tianwenxueshi daxi*. Beijing: Zhongguo kexue jishu chubanshe, 2007.
- Chen Xiaozhong 陳曉中, and Zhang Shuli 張淑莉. *Zhongguo gudai tianwen jigou yu tianwen jiaoyu* 中國古代天文機構與天文教育. *Zhongguo tianwenxueshi daxi*. Beijing: Zhongguo kexue jishu chubanshe, 2008.
- Chen Zungui 陳遵嫻. *Zhongguo tianwenxue shi* 中國天文學史. 2d ed. Shanghai: Shanghai renmin chubanshe, 2006.
- Csikszentmihályi, Mark, and Michael Nylan. “Constructing Lineages and Inventing Traditions through Exemplary Figures in Early China.” *T’oung Pao* 89, no. 1/3 (2003): 59–99.
- Cullen, Christopher. *Astronomy and Mathematics in Ancient China: The Zhou bi suan jing*. Cambridge: Cambridge University Press, 1996.
- . “Cosmographical Discussions in China from Early Times up the T’ang Dynasty.” Ph.D. diss., University of London, 1977.
- . “Seeing the Appearances: Ecliptic and Equator in the Eastern Han.” *Ziran kexue shi yanjiu* 自然科學史研究 2000.4 (2000): 352–382.
- Cullen, Christopher and Anne S. L. Farrer. “On the Term *hsüan chi* and the Three-Lobed Jade Discs.” *Bulletin of the School of Oriental and African Studies* 46, no. 1 (1983): 53–76.
- De Crespigny, Rafe. *Portents of Protest in the Later Han Dynasty: The Memorials of Hsiang Kai to Emperor Huan in 166 A.D.* Canberra: Australian National University Press in association with the Faculty of Asian Studies, Australian National University, 1976.

- Deane, Thatcher Elliott. “The Chinese Imperial Astronomical Bureau: Form and Function of the Ming Dynasty *Qintianjian* from 1365 to 1627.” Ph.D. diss., University of Washington, 1989.
- Eberhard, Wolfram. “The Political Function of Astronomy and Astronomers in Han China.” In *Chinese Thought and Institutions*, edited by John Fairbank, 37–70. Chicago: University of Chicago Press, 1957.
- Espenak, Fred, and Jean Meeus. *Five Millennium Canon of Solar Eclipses: –1999 to +3000 (2000 BCE to 3000 CE)*. Washington, DC: National Aeronautics and Space Flight Administration, 2007.
- Foley, N. “A Statistical Study of the Solar Eclipses Recorded in Chinese and Korean History during the Pre-Telescopic Era.” M.S. Thesis, University of Durham, 1989.
- Franke, Herbert. “Some Remarks on the Interpretation of Chinese Dynastic Histories.” *Oriens* 3, no. 1 (1950): 113–122.
- Harper, Donald. “The Textual Form of Knowledge: Occult Miscellanies in Ancient and Medieval Chinese Manuscripts, Fourth Century B.C. to Tenth Century A.D.” In *Looking at It from Asia: The Processes That Shaped the Sources of History of Science*, edited by Florence Bretelle-Establet, 37–80. Dordrecht: Springer, 2010.
- Hashimoto Keizō 橋本敬造. “Reiken” 靈憲. In *Chūgoku temmongaku: sūgaku shū* 中國天文學·數學集, edited by Yabuuti Kiyosi 藪内清, 352–362. Tōkyō: Asahi shuppansha, 1980.
- Henderson, John B. “Premodern Chinese Notions of Astronomical History and Calendrical Time.” In *Notions of Time in Chinese Historical Thinking*, edited by Chun-chieh Huang and John B. Henderson, 97–113. Hong Kong: Chinese University Press, 2006.
- Ho Peng Yoke 何丙郁. *The Astronomical Chapters of the Chin Shu*. Paris: Mouton, 1966.
- Hua Tongxu 華同旭. *Zhongguo louke* 中國漏刻. Hefei: Anhui kexue jishu chubanshe, 1991.
- Huang Yi-long 黃一農. *Shehui tianwenxue shi shi jiang* 社會天文學史十講. Shanghai: Fudan daxue chubanshe, 2004.
- Jiang Xiaoyuan 江曉原. *Zhongguo xingzhanxue leixing fenxi* 中國星占學類型分析. Shanghai: Shanghai shudian chubanshe, 2009.
- . *Xingzhanxue yu chuantong wenhua* 星占學與傳統文化. Shanghai: Shanghai guji chubanshe, 1992.
- Jin Zumeng 金祖孟. *Zhongguo gu yuzhoulun* 中國古宇宙論. Shanghai: Huadong shifan daxue chubanshe, 1991.
- Kalinowski, Marc. “Astrologie calendaire et calcul de position dans la Chine ancienne: les mutations de l’hémérologie sexagésimale entre le IV^e et le II^e siècles avant notre ère.” *Extrême-orient, Extrême-occident* 18 (1996): 71–113.
- . “La rhétorique oraculaire dans les chroniques anciennes de la Chine: Une étude des discours prédictifs dans le *Zuozhuan*.” *Extrême-Orient, Extrême-Occident* 21 (1999): 37–65.

- . “Le calcul du rayon céleste dans la cosmographie chinoise.” *Revue d’histoire des sciences* 43, no. 1 (1990): 3–34.
- Kern, Martin. “Religious Anxiety and Political Interest in Western Han Omen Interpretation: The Case of the Han Wudi Period (141–87 B.C.).” *Chūgoku shigaku* 中國史學 10 (2000): 1–31.
- Lien, Yeong-Chung Edmund. “Zhang Heng, Eastern Han Polymath, His Life and Works.” Ph.D. diss., University of Washington, 2011.
- . “Zhang Heng’s *Huntian Yi Zhu* Revisited.” *T’oung Pao* 98, no. 1–3 (2012): 31–64.
- Loewe, Michael. “The Cosmology of Early China.” In *Ancient Cosmologies*, edited by Carmen Blacker, Michael Loewe, and J. Martin Plumley, 87–109. London: Allen and Unwin, 1975.
- Lu Yang 盧央. *Zhongguo gudai xingzhanxue* 中國古代星占學. Beijing: Zhongguo kexue jishu chubanshe, 2007.
- Mansvelt Beck, B. J. *The Treatises of Later Han: Their Author, Sources, Contents, and Place in Chinese Historiography*. Leiden: E.J. Brill, 1990.
- Maspero, Henri. “L’astronomie chinoise avant les Han.” *T’oung Pao* 2d ser., 26, no. 4/5 (1929): 267–356.
- . “Les instruments astronomiques des Chinois au temps des Han.” *Mélanges chinois et bouddhiques* 6 (1939): 183–370.
- Morgan, Daniel Patrick. “A Sphere unto Itself: The Death and Medieval Framing of the History of Chinese Cosmology.” *Historia Scientiarum* forthcoming March 2017 (2017).
- . *Astral Sciences in Early Imperial China: Observation, Sagehood and the Individual*. Cambridge: Cambridge University Press, forthcoming.
- . “Mercury and the Case for Plural Planetary Traditions in Early Imperial China.” In *The Circulation of Astronomical Knowledge in the Ancient World*, edited by John M. Steele, 416–450. Leiden: Brill, 2016.
- . “Sphere Confusion: Towards a Textual Reconstruction of Instruments and Observational Practice in First-Millennium CE China.” *Centaurus* 58, no. 1 (2016): xx–xx.
- Nakayama Shigeru 中山茂. *A History of Japanese Astronomy: Chinese Background and Western Impact*. Cambridge: Harvard University Press, 1969.
- Needham, Joseph. *Science and Civilisation in China, vol.3: Mathematics and the Sciences of the Heavens and the Earth*. Cambridge: Cambridge University Press, 1959.
- Pan Nai 潘鼐, ed. *Zhongguo gu tianwen yiqi shi* 中國古天文儀器史. Colour print ed. Taiyuan: Shanxi jiaoyu chubanshe, 2005.
- . *Zhongguo hengxing guance shi* 中國恆星觀測史. Shanghai: Xuelin chubanshe, 1989.

- Pankenier, David W. *Astrology and Cosmology in Early China: Conforming Earth to Heaven*. Cambridge: Cambridge University Press, 2013.
- Qin Jianming 秦建明. “Gaitian tuyi kao” 蓋天圖儀考. *Wenbo* 文博 2008.1 (2008): 4–10.
- Sivin, Nathan. *Granting the Seasons: The Chinese Astronomical Reform of 1280, with a Study of Its Many Dimensions and a Translation of Its Records*. New York: Springer, 2009.
- . “On the Limits of Empirical Knowledge in the Traditional Chinese Sciences.” In *Time, Science, and Society in China and the West*, edited by Julius Thomas Fraser, Nathaniel Morris Lawrence, and Francis C. Haber, 151–169. Amherst: University of Massachusetts Press, 1986.
- Steele, John M. *Observations and Predictions of Eclipse Times by Early Astronomers*. Archimedes: New Studies in the History and Philosophy of Science and Technology. Dordrecht: Kluwer Academic Publishers, 2000.
- Stephenson, F. Richard. *Historical Eclipses and Earth’s Rotation*. Cambridge: Cambridge University Press, 1997.
- Sun Xiaochun 孫小淳, and Jacob Kistemaker. *The Chinese Sky during the Han: Constellating Stars and Society*. Leiden: Brill, 1997.
- Swann, Nancy Lee. *Pan Chao: Foremost Woman Scholar of China, First Century A.D.: Background, Ancestry, Life, and Writings of the Most Celebrated Chinese Woman of Letters*. New York: Russell & Russell, 1968.
- Wang Yumin 王玉民. *Yi chi liang tian: Zhongguo gudai mushi chidu tianxiang jilu de lianghua yu guisuan* 以尺量天—中國古代目視尺度天象記錄的量化與歸算. Jinan: Shandong jiaoyu chubanshe, 2008.
- Wu Shouxian 吳守賢, and Liu Ciyuan 劉次沅. “28 xiu juxing sanqian nian lai de ping weizhi ji qi yu gudai guance de bijiao” 28 宿距星三千年來的平位置及其與古代觀測的比較. *Shaanxi tianwentai taikan* 陝西天文臺臺刊 8, no. 1 (1985): 7–44.
- Wu Shouxian 吳守賢, and Quan Hejun 全和鈞. *Zhongguo gudai tianti celiangxue ji tianwen yiqi* 中國古代天體測量學及天文儀器. *Zhongguo tianwenxueshi daxi*. Beijing: Zhongguo kexue jishu chubanshe, 2008.
- Xu Jie 許結. *Zhang Heng pingzhuan* 張衡評傳, *Zhongguo sixiangjia pingzhuan congshu* 中國思想家評傳叢書 26. Nanjing: Nanjing daxue chubanshe, 1999.
- Zhang Peiyu 張培瑜. *Sanqianwubai nian liri tianxiang* 三千五百年曆日天象. Zhengzhou: Daxiang chubanshe, 1997.
- Zhuang Weifeng 莊威鳳, ed. *Zhongguo gudai tianxiang jilu de yanjiu yu yingyong* 中國古代天象記錄的研究與應用. *Zhongguo tianwenxueshi daxi*. Beijing: Zhongguo kexue jishu chubanshe, 2009.

Book of Sui “Heavenly Patterns Monograph” TOC

天文上 Heavenly Patterns juan A
[Historical Introduction]: (¶1-2) philosophical & historical précis from sage times to the 6th cent.; (¶3) author’s account of the provenance of the early Tang sphere instrument; (¶4) organization of the treatise according to <i>Shiji</i> & <i>Han shu</i> , an overview of astral forms, names, omens, & verifications.
[Cosmology & Instrumentation]
天體 Heaven’s Form: (¶1) the “three schools”
[蓋天 Awning Heaven]: (¶2-3) origins & features of <i>Gnomon of Zhou</i> cosmology; (¶4) excerpt: Yang Xiong’s (53-18 BCE) “Eight Difficulties with Awning Heaven”; (¶5) conclusion: Huan Tan, Zheng Xuan, Cai Yong, & Lu Ji have disproved it, Liang Wudi rehashes it only to dislodge Sphere Heaven.
[宣夜 Expansive Night]: (¶6) origin of the now-lost theory from Xi Meng [excerpt]; (¶7) 335/342, Yu Xi composes <i>Antian lun</i> [excerpt], Ge Hong criticizes it [excerpt], Xi’s grandfather Song composed a <i>Qiongtian lun</i> [excerpt]; Yao Xin wrote a <i>Xuantian lun</i> [excerpt]; judgment: these were strange theories that could not account for all the data (<i>shu</i>).
[渾天 Sphere Heaven]: (¶8) brief description of the bird-egg metaphor; Wang Chong’s case against Sphere Heaven; (¶9-14) [excerpt: Ge Hong’s rebuttal of Wang Chong]; (¶15) [excerpt: He Chengtian’s <i>Lun huntian xiangti</i>]; judgment: this is essentially the same as Wang Fan’s cosmology as found in the <i>Jin shu</i> .
Problem: (¶16) old explanations failed to address seasonal variation in temperature, daylight hours, and (perceived) solar proximity. Solution: (¶17) [excerpt: <i>Liezi</i>]; (¶18) [excerpt: Huan Tan, <i>Xin lun</i>]; (¶19) [excerpt: Zhang Heng, <i>Lingxian</i>]; (¶20) Shu Xi on optical illusions; (¶21) [excerpt: Jiang Ji]; (¶22–25) [excerpt: Zu Geng].
渾天儀 Sphere Instruments (observational): (¶1) the <i>Documents</i> ’ “rotating-device & jade traverse” and opinions concerning the sage-origins of the armillary sphere; judgment: probably invented by Luoxia Hong <i>circa</i> 104 BCE; (¶2) history of instruments over Eastern Han; (¶3) detailed description of the Liang palace armillary sphere, recovered from Xianyang in 420/422; in their respective histories of the Liu-Song, He Chengtian, Xu Yuan, and Shen Yue identify this as Zhang Heng’s, which was lost with the fall of the Western Jin in 317; judgment: this is wrong; (¶4) 398, the Northern Wei court commissions Grand Clerk Chao Chong to construct an armillary sphere; 412, Clerk’s Office ordered to construct an iron armillary sphere; [excerpt: inscription]; description; judgment: this is the instrument employed at the current observatory.
渾天象 Sphere Effigies (demonstrational): (¶1) general description; description of wooden model in late-Liang storehouse; judgment: this might be what Sun-Wu Grand Clerk Chen Miao referred to as a “Sphere heaven”; armillary spheres and celestial spheres are manifestly different, Zhang Heng’s instrument was clearly of the latter type; it is bizarre that He Chengtian did not know the difference; (¶2) 436, Liu-Song court commissions Grand Clerk Qian Lezhi to construct a new sphere effigy, which he does according to the Sun-Wu expert Ge Heng’s precedent, making it water-driven and placing Earth at the center of Heaven (as per Sphere Heaven); (¶3) 440, Liu-Song court commissions a smaller celestial sphere that color-codes the asterisms of the Three Experts’ catalogs; (¶4) the Liu-Song instruments were brought to Chang’an in 589 and moved to the palace <i>circa</i> 605.
蓋圖 Awning Diagrams: (¶1) origin: the sages Zhuangxi and Huangdi invented the armillary sphere and Awning Heaven diagram, respectively, for the sake of rectifying calendro-astronomy; description & functional limitations <i>vis-à-vis</i> the armillary sphere; description; judgment: since the Sui, the Awning diagram is still used for arraying the 28 lodges rather than the (superior) celestial sphere; (¶2–5) [excerpt: Liu Zhuo’s 604 memorial on Sphere Heaven discussing the history of the armillary sphere to his day; the potential for error in instrument correction, the empirical absurdity of other cosmological schools, and

his work to synthesize and correct cosmological/instrumental theory in writing; and his work at overturning the 1- <i>cun-per-li</i> rule through gnomon surveys, which came to a halt upon his death in 607].
地中 The center of the earth: (¶1) canonical quotations concerning the shadow cast by a gnomon at the center of the earth; [excerpt: Zu Geng, <i>Cuozong jingzhu</i> on fixing the center of the earth by establishing the cardinal directions through gnomons].
晷影 Gnomonics: (¶1) canonical quotations concerning gnomonics, judgment: canonical methods are rudimentary, cursorily described, poorly understood, and contested; excerpts from recent (historical) experts, judgment: recent works are a mess due to a reliance on textual authority and extrapolation; (¶2) Overview of the instruments and projects of the Five Dynasties; (¶3) in response to the failure of the early Sui astronomical debate, Prefect Grand Clerk Yuan Chong memorialized the throne in 599 to report anomalies in solstitial shadow readings as a political omen [excerpt]; in response, Wendi fired Yuan Chong, named an heir apparent, announced the inauguration of a new era (Renshou [601–604]), and drafted artisans for new construction projects, judgment: the debaters mistook a normal phenomenon as an omen; (¶4) an account of gnomon surveys and reassessing the shadow-differential-per- <i>li</i> -travelled problem.
漏刻 Waterclock: (¶1) the invention of and the classical standards concerning the waterclock; (¶2) history of the waterclock from the Han: Zhang Cang inherited the Qin system, the situation in Han Wudi’s reign, Huo Rong’s 103 memorial suggesting that the day/night ratio in civil timekeeping be adjusted according to seasonal changes in solar declination, and the historical success of this decision; (¶3) Liu-Song, He Chengtian used lunar eclipses to indirectly observe the sun and adjust the place of winter solstice and discovered a discrepancy in equinoctial shadow lengths, which, after debate, resulted in a new approach to the waterclock; overview of Five Dynasties time policies; (¶4) the Sui inherited the Zhou system until Yuan Chong offered up his own, judgment: this was rudimentary, based on “private knowledge,” and was inaccurate; (¶5) beginning in 597, armillary observations of the equinoctial <i>position</i> of the sun confirmed the results of gnomonics, leading to the implementation of the solar equation of center into the civil calendar; changes to timekeeping practices were, however, never implemented; (¶6) beginning in 605, Geng Xun was commissioned to construct a variety of waterclocks for the court whose designs were noteworthy breaks from the past.
[Catalog of Astral Lore] (note: contents are largely identical to the <i>Book of Jin</i> and other treatises in the genre)
經星中宮 Canon Stars, circumpolar: (¶1-28) catalog of asterisms introducing star-count, relative position, alternate names, constituent star names, and classical & omenological lore
天文 Heavenly Patterns <i>juan B</i>
二十八舍 The 28 Lodges: (¶1-28) ditto.
星官在二十八宿之外者 Other Constellations: (¶1-26) ditto.
天占 Heaven Omens: (¶1) theory: excerpt from <i>Hongfan wuxing zhuan</i> on the sky changing color, splitting open, shrieking, etc. ; (¶2-3) extraordinary examples from 194 BC & 303 CE.
七曜 The Seven Luminaries: (¶1-7) descriptions of each of the seven luminaries’ astronomical movements, symbolic & correlative associations, core omenological rationale, and individual omens derived therefrom; (¶8-20) general rules for stars/planets: normal/abnormal star colors, field allocation theory, wrong behavior, five-agent conjunctions, lunar occultation, planetary groupings, normal/abnormal planet colors, abnormal speeds, quadrant associations, and the realization/violation of typical synodic phenomena; (¶21) account of progress made in planetary theory since antiquity, namely the normalization of retrogradation, and Zhang Zixin’s discovery of the inequality of planetary motion and the seasonal variability of Mercury’s visibility; (¶22) description of Zu Geng and Yu Jicai’s omen compendia, note: the following “miscellaneous stars” come from them.
瑞星 Auspicious Stars: (¶1) alternate names, physical description, origins, functions, lore, and omenology.
星雜變 Miscellaneous Stellar Incidents: (¶1) ditto, covers daytime visibility, nighttime

invisibility, “fighting,” and “crashing”.
妖星 Freak Stars: (¶1-3) ditto, covers various comets; (¶4-8) ditto, covers comets manifest from the essence of each of the five planets.
雜姚 Miscellaneous Freaks: (¶1-17) ditto, enumerated list covering comets and anomalous “stars”; (¶18-24) miscellaneous addenda.
客星 Guest Stars: (¶1-2) ditto, five-fold typology corresponding with the five agents and field allocation, instructions for divining concerning color and size.
流星 Shooting Stars: (¶1-4) ditto.
雲氣·瑞氣 Cloud qi & Auspicious qi: (¶1) ditto.
妖氣 Freak qi: (¶1) ditto.
天文下 Heavenly Patterns <i>juan C</i>
十輝 Ten Lusters: (¶1) canonical precedence and typology, covering meteorological phenomena and the brightness of the sun and moon; (¶2) the symbolic associations of the sun and omens concerning the color and brightness of the sun and moon; (¶3) typology and omenology of meteorological/optical phenomena occurring around the sun; (¶4-12) omens concerning specific combinations and dispositions of such phenomena.
雜氣 Miscellaneous qi: (¶1-30) physical descriptions and omenology for miscellaneous <i>qi</i> .
五代災變應 Five Dynasties Disasters, Incidents, and Responses: reports of 293 independent phenomena observed between 502 to 617 pertaining to the Liang, Chen, Northern and Eastern Wei, Northern Qi, Northern Zhou, and Sui.