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Mercury and the Case for Plural Planetary Traditions in Early Imperial China

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Fragmentation, not unity, was the rule in ancient China.
Terry Kleeman¹

1 Introduction

The history of astronomy in China, we are told, is a history of policy reform decided at court and realized by functionaries. This is a narrative espoused by practitioners—men and women for whom the meaning of their sciences lay as firmly in the patterns (*wen* 文) of the past as in those of heaven (*tian* 天)—and it is a narrative repeated in histories to our day. Ban Gu’s 班固 (A.D. 32–92) *Book of Han* offers us one of earliest précis of this kind. “The origin of *li* numbers” 曆數之起, he tells us, lay with the thearchs and sage kings of the aeon past, who, in their wisdom, delegated functionaries to “*li* and *xiang* the sun, moon, and stars and respectfully grant the people the seasons” 曆象日月星辰, 敬授民時.² The sages, however, left us as much with a pattern for success as one of failure: rector Chong 重 & Li 黎 lost their virtue in rebellion, brothers Xi 羲 & He 和 lost themselves in drink, the temporal order teetering ever on the brink

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¹*Great Perfection: Religion and Ethnicity in a Chinese Millennial Kingdom* (Honolulu: University of Hawai’i Press, 1998), 1.

²*Han shu* 漢書 (Zhonghua shuju 中華書局 ed.), 22A.973.

of chaos. It was *this* pattern, Ban Gu reminds us, that rippled through the age of man.

故自殷周，皆創業改制，咸正曆紀，服色從之，順其時氣，以應天道。三代既沒，五伯之末，史官喪紀，疇人子弟分散，或在夷狄，故其所記，有黃帝、顓頊、夏、殷、周及魯曆。

Thus it is that all [new dynasties] since the Yin 殷 (?–1045 B.C.) and Zhou 周 (1045–771 B.C.) have corrected the *li* cycles and changed the color of [court] attire accordingly so as to obey the *qi* of their time and respond to the Dao of Heaven. After the Three Dynasties (Xia 夏, Yin-Shang 殷商, and Zhou) had disappeared, and at the end of the Five Earls (i.e. the Spring & Autumn period, 770–481 B.C.), the Clerk’s Office lost its cycle/discipline, and its hereditary practitioners and their disciples dispersed, some to the Yi 夷 and Di 狄 [tribes]. This is why they record the Yellow Emperor, Zhuaxun 顓頊, Xia 夏, Yin, Zhou, and Lu 魯 (771–249 B.C.) *li*.³

History proper picks up in the Han 漢 (206 B.C. – A.D. 220), whence the standard histories begin to follow astronomy court-by-court, reform-by-reform, along a line—a *dao*—predestined in its origins. This line, traced and retraced to our day, adumbrates a tradition of timeless integrity utterly unique within the world. But temporal order, let us not forget, is an imperative, an obsession, and a struggle waged against all odds.

The aim of this paper is to foreground disunities evident in the early astral sciences and explore how such disunities were perceived, perpetuated, and reconciled by later thinkers. First and foremost in this regard was the line drawn by practitioners themselves between the sciences of *tian-wen* 天文 ‘heavenly patterns’ and *li* 曆. Roughly speaking, *tian-wen* : the outdoors : phenomena :: *li* : the indoors : data (text), which is to say that *tian-wen* concerns the observation, measurement, interpretation, and recording of *xiang* 象 ‘image/symbol/phenomena’, while *li* (‘sequence’, ‘calendar’, and, thus, ‘calendro-astronomy’) concerns the manipulation of data, tables, procedures, and counting rods. To “*li* and *xiang* the sun, moon, and stars,” therefore, is to invoke (or *convoke*) in the early imperial mind distinct practices, skill-sets, textual genres, and professions dealing, respectively, with temporal and spatio-semantic order. The depth of the divide is easily assayed by a glance at the technical literature: self-identified *tian-wen* literature consists of catalogues of bodies, phenomena, and omina, and/or historical records; *li* literature, on the other hand, is composed of computational manuals and the tables, calendars, and ephemerides (*li*)

³*Han shu*, 21A.973. On the “the six ancient calendar systems” (*gu liu li* 古六曆), see Zhang Peiyu 張培瑜 et al., *Zhongguo gudai lifa* 中國古代曆法 (Beijing: Zhongguo kexue jishu chubanshe, 2008), 251–390; Hirase Takao 平勢隆郎, *Chūgoku kodai kinen no kenkyū: tenmon to koyomi no kentō kara* 中國古代紀年の研究 : 天文と曆の検討から (Tōkyō: Kyūko Shoin, 1996); Robert H. Gassmann, *Antikchinesisches Kalenderwesen: die Rekonstruktion der chungqiu-zeitlichen Kalender des Fürstentums Lu und der Zhou-Könige* (Bern: Peter Lang, 2002).

calculated therefrom.⁴

One of the places where the domains of *tian-wen* and *li* overlap is planetary models. In this paper, we will examine the case of Mercury models as an example of the divide and interaction between the Chinese astral sciences. We will begin with introductions to the earliest materials on each side of the divide to explain the respective mechanics, assumptions, and functions behind them. The *tian-wen* models, I hope to show, make sense only as hemerologies whose function is to provide idealized norms of auspicious behaviour within the context of omen reading, while *li*, on the other hand, provides us with what we would expect from mathematical models. The fact that what I identify as *tian-wen* models purport to occur centuries prior to planetary *li* has fostered the assumption that one is ancestral to the other. In the following section, however, I present evidence of the extensive use and development of ‘old’ *tian-wen* models beyond the advent of *li* as proof, instead, of their filling different niches. Then, in the final section, we then try to understand how it was that experts reconciled the two and how planetary hemerology eventually disappeared from the *tian-wen* genre.

2 The pre-*li* planetary models

Preserved in the *Book of Han*, the earliest extant *li* manual is that of the Triple Concordance system (*Santong li* 三統曆), which Liu Xin 劉歆 (c. 50 B.C. – A.D. 23) composed circa A.D. 5 on the basis of the Grand Inception system (*Taichu li* 太初曆) of 104 B.C.⁵ We can say little more about *li* before this date.⁶ We do, however, find planetary models in self-identified *tian-wen* sources predating the Triple Concordance system. Three of these sources are extant and firmly provenances to the two centuries prior: the ‘Heavenly Offices Monograph’ in Sima Qian’s 司馬遷 (c. 145 – c. 86 B.C.) *Records of the Grand Historian* (1st cent. B.C.); the ‘Heavenly Patterns’ chapter of the *Huainanzi* 淮南子 (139 B.C.);

⁴*Tian-wen* and *li* are areas around which a considerable body of secondary literature has amassed. The best Western-language introductions by far to the topic of *tian-wen* and Chinese uranomancy are Nakayama Shigeru 中山茂, ‘Characteristics of Chinese Astrology’, *Isis* 57, no. 4 (1966): 442–454; Ho Peng Yoke 何丙郁, *The Astronomical Chapters of the Chin Shu* (Paris: Mouton, 1967). For *li*, see Christopher Cullen, *Astronomy and Mathematics in Ancient China: The Zhou Bi Suan Jing* (Cambridge: Cambridge University Press, 1996), 1–66; Nathan Sivin, *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).

⁵On the Triple Concordance system, see Michel Teboul, *Les premières théories planétaires chinoises* (Paris: Collège de France, 1983). On the life and work of Liu Xin, see Xu Xingwu 徐興無, *Liu Xiang pingzhuan: fu Liu Xin pingzhuan* 劉向評傳: 附劉歆評傳, *Zhongguo sixiangjia pingzhuan congshu* 21 (Nanjing: Nanjing daxue chubanshe, 2005).

⁶What little there is to say before 104 B.C. generally concerns the reconstruction of the civil calendar on the basis of extant calendars and date notations. See, for example, the studies mentioned in Note 3 and Zhang Peiyu, ‘Genju xinchu liri jiandu shilun Qin he Han chu de lifa’ 根据新出歷日簡牘試論秦和漢初的曆法, *Zhongyuan wenwu* 中原文物 2007.5: 62–77; Li Zhonglin 李忠林, ‘Zhoujiatai Qin jian lipu xinian yu Qin shiqi lifa’ 周家臺秦簡曆譜係年與秦時期曆法, *Lishi yanjiu* 歷史研究 2010.6: 36–53. The one exception to this is the Mawangdui manuscript *Planetary Omina* (see Note 14).

and the untitled silk manuscript dubbed *Planetary Omina* (*Wu xing zhan* 五星占) excavated from Mawangdui 馬王堆 tomb 3 (sealed 168 B.C.). Three more are fragments attributed by later sources to the problematic pre-imperial figures Wuxian 巫咸, Shi Shen 石申, and Gan De 甘德 (hereafter, “the Three Experts”). The discussion of Chinese planetary astronomy usually begins here.⁷

As to the early planetary models, any discussion of the state of the field must begin at the source: the *Kaiyuan Omen Classic* (*Kaiyuan zhanjing* 開元占經), the massive 120-volume *tian-wen* compendium compiled in A.D. 729 by Gautama Siddhārtha 瞿曇悉達, a Chinese-born Indian-lineage expert active in the Tang 唐 (A.D. 618–907) astronomical office.⁸ It is thanks to Gautama’s meticulous cataloguing of sources that we know as much as we do about the early professional literature (as opposed to the *historical* literature of the standard history monographs), but it is thanks his occasional commentary that we know also what Gautama thought about it. Gautama opens the section on Mercury as follows:

『洪範五行傳』曰：「辰星以上元甲子歲，十一月甲子朔旦，冬至夜半甲子時，與日月五星俱起牽牛前五度，右行迅疾，常與日月相隨，見於四仲以正四時，歲一周天。」

The *Hongfan wuxing zhuan* (1st cent. B.C.) says: “Mercury, starting from a high origin of $jiazi_{.01/60}$ -XI- $jiazi_{.01/60}$ new moon, with winter solstice at midnight, hour $zi_{S01/12}$, of day $jiazi_{.01/60}$ and the sun, moon, and planets starting together 5 *du* 度 before Led Ox_{L09/28} (α^2/β Cap),⁹ travels swiftly to the right (anticlockwise), constantly accompanying the sun and the moon; it appears in the four mid-season months to set straight the four seasons, making one circuit

⁷For example, Henri Maspero, ‘L’astronomie chinoise avant les Han’, T’oung Pao 2d ser., 26, no. 4/5 (1929): 267–356; Teboul, *Les premières théories planétaires chinoises*; Takeda Tokimasa 武田時昌, ‘Taihaku kōdo kō: Chūgoku kodai no wakusei undōron’ 太白行度考—中國古代の惑星運動論, *Tōhō gakuhō* 東方學報 85 (2010): 1–44. Additional early sources not covered in these studies can be found in Table 2.

⁸On Gautama and the foreign lineage experts at the Tang astronomical office, see Jiang Xiaoyuan 江曉原, ‘Liuchao Sui Tang chuanru zhongtu zhi Yindu tianxue’ 六朝隋唐傳入中土之印度天學, *Hanxue yanjiu* 漢學研究 10, no. 2 (1992): 253–277; Lai Swee Fo 賴瑞和, ‘Tangdai de Hanlin daizhao he Sitiantai’ 唐代的翰林待詔和司天臺, *Tang yanjiu* 唐研究 9 (2003): 315–342. On the introduction and translation of foreign astral sciences in this period through the vector of Buddhism, see Niu Weixing 鈕衛星, *Xi wang Fantian: Hanyi Fojing zhong de tianwenxue guanliu* 西望梵天: 漢譯佛經的天文學源流 (Shanghai: Shanghai jiaotong daxue chubanshe, 2004).

⁹Note that all dates are given in y - m - d format. Years and days are given either in ordinal numbers or sexagenary notation ($n/60$), *chen* 辰 double-hours are given in earthly branches (Bn/12), and right ascension is counted in ‘lodge entry *du*’ (*ru xiu du* 入宿度) counted from the guide star (*ju xing* 距星), given in parentheses, of a particular lodge (Ln/28; see Figure 2). Note that the *du* is a pseudo-angle defined as the daily travel of the (mean) sun in one day, there being thus approximately $365\frac{1}{4}$ *du* to the ‘circumference of heaven’ (*zhou tian* 周天). For an explanation of Chinese astronomical conventions, see Sivin, *Granting the Seasons*, 67–97. On the twenty-eight lodges, see Christopher Cullen, ‘Translating 宿 **sukh/xiu* and 舍 **lhah/she*—“lunar Lodges”, or Just Plain “lodges”?’’, *East Asian Science, Technology, and Medicine* no. 33 (2011): 76–88.

of heaven in one year.”¹⁰

To this, Gautama provides the following commentary:

案歷法，辰星夕見西方三十日而伏，二十二日而晨見東方而伏，伏入三十三日一千五百四十分日之一千一百六十八奇六十六復夕見西方如初。一終凡一百一十五日一千一百七十八奇六十六，星行度數亦如之。是七十七年而二百四十九終也。星平行日一度，一年周天。舊說皆云「辰星效四仲」以為謬矣。

According to *li* method, Mercury appears in the evening in the west for 30 days before hiding, 22 days before appearing in the morning in the east and then hiding, it hides and enters for 33 days & $1168\frac{66}{x}/1540$ day and appears again in the evening like the first time. From start to finish it takes a total of 115 days & $1168\frac{66}{x}/1540$ day, and the *du* travelled are also as much. This makes 249 complete cycles in 77 years. The star’s mean motion is one *du* per day, making a circuit of Heaven in one year. The old doctrines all say that “Mercury appears in the four mid-season months,” which is absurd.¹¹

It is not until modern times that scholars have deigned to reconsider the ‘absurdities’ (*miu* 謬) of the ‘old’ (*jiu* 舊) models in all seriousness, their interest, like Gautama’s before them, being one of origins. What they added by way of explanation was a developmental teleology apropos the notion of the timeless tradition: that the ‘absurd’ early models *developed into* the comprehensible models of A.D. 5 and later, and that, *ipso facto*, we may determine a relative chronology between them on the basis of their accuracy and sophistication.¹² There are a number of problems with this approach, not the least of which being that the resultant chronology places the Three Experts’ planetary models centuries prior to (and often in reverse order than) that now generally accepted for the ‘star canons’ (*xing jing* 星經) attributed to them in the self-same sources: the (purportedly) fourth- and third-century B.C. catalogues of Shi Shen and Gan De having been composed cumulatively in that order and added to up through the first century A.D., and that of Wuxian (2nd mill. B.C.) being a pseudepigraphon of the third century A.D.¹³ Something is not right: why would works that are, in every other respect, open and accumulative towards contemporary knowledge *regress vis-à-vis* planetary knowledge?

To better understand Gautama’s objection to “the old doctrines,” let us examine several fuller expressions of Mercury’s seasonal behaviour. Our earliest

¹⁰*Kaiyuan zhanjing* 開元占經 (Siku quanshu 四庫全書 ed.), 53.2b–3a.

¹¹*Ibid.*, 53.2b–3a.

¹²For example, see Maspero, ‘L’astronomie chinoise avant les Han’, esp. 270; Teboul, *Les premières théories planétaires chinoises*, esp. 119, 137; Takeda, ‘Taihaku kōdo kō’.

¹³It is once again the *Kaiyuan Omen Classic* to which we owe the preservation of *both* the Three Experts’ planetary models and star canons. On the openness, order, and date of the latter, see Sun Xiaochun 孫小淳 and Jacob Kistemaker, *The Chinese Sky During the Han: Constellating Stars and Society* (Leiden: Brill, 1997), esp. 25–27, 37–39, 75–88.

securely datable source in this regard is the *Planetary Omina* tomb manuscript (*terminus ante quem* 168 B.C.):¹⁴

主正四時，春分效【婁】，夏至【效鬼】，秋分【效亢】，冬至效牽牛... 其出四中（仲），以正四時，經也；其上出四孟，王者出；其下出四季，大耗敗。凡是星出廿日而入，經也。□□廿日不入□□。

[Mercury] rules and rectifies the four seasons: at spring equinox it appears in [Pasture.L16/28 (β Ari)], at summer solstice [it appears in Devils.L23/28 (θ Cnc)], at autumn equinox [it appears in Neck.L02/28 (κ Vir)], and at winter solstice it appears in Led Ox.L09/28 (α^2/β Cap)... If it rises in the four mid-season months, it does so to set straight the four seasons—this is normal—; if it rises up in the four first months of the seasons, a [new] true king emerges; if it rises down in the four final months of the seasons, there is great depletion and defeat. In general, this star (planet) sets 20 days after rising—this is normal—while... not setting in twenty days... (lines 54–56).

Compare this to the *Records of the Grand Historian* monograph (c. 90 B.C.):

是正四時：仲春春分，夕出郊奎、婁、胃東五舍，為齊；仲夏夏至，夕出郊東井、輿鬼、柳東七舍，為楚；仲秋秋分，夕出郊角、亢、氐、房東四舍，為漢；仲冬冬至，晨出郊東方，與尾、箕、斗、牽牛俱西，為中國。其出入常以辰、戌、丑、未。

[Mercury] rectifies the four seasons: mid-spring month, spring equinox, it emerges in the evening from the suburbs (sic.) in the five lodges east of/from Crotch.L15/28 (β/σ And), Pasture.L16/28 (β Ari), and Stomach.L17/28 (41/35 Ari), where it acts upon [the State of] Qi 齊; mid-summer month, summer solstice, it emerges in the evening from the suburbs (sic.) in the seven lodges east of/from Eastern Well.L22/28 (γ/μ Gem), Cartbourne Devils.L23/28 (θ Cnc), and Willow.L24/28 (δ Hya), where it acts upon [the State of] Chu 楚; mid-autumn month, autumn equinox, it emerges in the evening from the suburbs (sic.) in the four lodges east of/from Horn.L01/28 (α Vir), Neck.L02/28 (κ Vir), Root.L03/28 (α^2 Lib), and Chamber.L04/28 (δ Sco), where it acts upon [the State of] Han 漢; mid-winter month, winter solstice, it emerges in the morning from the suburbs (sic.) west of/from Tail.L06/28 (κ/μ Sco), Basket.L07/28 (γ Sag), Dipper.L08/28

¹⁴For recent studies on the Mawangdui *Planetary Omina*, see Yabuuti Kiyosi 藪内清, ‘Baōtai san go bo shutsudo no Gosei sen ni tsuite’ 馬王堆三號墓出土の「五星占」について, in *Tōhōgaku ronshū: Ono Katsutoshi Hakushi shōju kinen* 東方學論集 : 小野勝年博士頌壽記念, ed. Ono Katsutoshi 小野勝年 (Kyōto: Ryūkoku daigaku tōyō shigaku kenkyūkai, 1982), 1–12; Christopher Cullen, ‘Understanding the Planets in Ancient China: Prediction and Divination in the *Wu xing zhan*’, *Early Science and Medicine* 16 (2011): 218–251; ‘*Wu Xing Zhan* 五星占 “Prognostics of the Five Planets”’, *SCIAMVS* 12 (2011): 193–249; Daniel Patrick Morgan, ‘The Planetary Visibility Tables in the Second-Century BC Manuscript *Wu xing zhan* 五星占’, *East Asian Science, Technology, and Medicine* (forthcoming). For the text of the *Planetary Omina* MS itself, see Liu Lexian’s 劉樂賢 version in *Mawangdui tianwen shu kaoshi* 馬王堆天文書考釋 (Guangzhou: Zhongshan daxue chubanshe, 2004), 29–99.

(σ/ϕ Sag), and Lex Ox.L09/28 (α^2/β Cap), where it acts upon the central states. Its emergence and entry is normally at *chen*.B05/12 (ESE), *xu*.B11/12 (WNW), *chou*.B02/12 (ENE), and *wei*.B08/12 (SSW).¹⁵

More-or-less parallel descriptions are attributed to Gan De and Shi Shen, respectively, in the *Kaiyuan Omen Classic*.¹⁶

From the perspective of astronomy, it is difficult to understand just what pattern these models describe. For starters, the language is ambiguous and contradictory. Our sources seem to distinguish the verb *xiao* 效/効 ('to render service' or 'to appear')—the *Records of the Grand Historian* mistakenly reads *jiao* 郊 'suburbs'—from *chu* 出 ('to emerge'). In an astronomical context, *chu* always denotes rising/first visibility; it is not clear, therefore, whether the terms *xiao*, *jiao*, and, later, *xian* 見 'appear' are freely interchangeable with *chu* or are intended to denote something else, e.g. *any* visibility. Furthermore, our sources contradict one another (and even themselves) on where these phenomena occur in time—the *month* and/or *day* of the solstices and equinoxes—and in space—5–15 *du* lodges or 41–112 *du* spans.

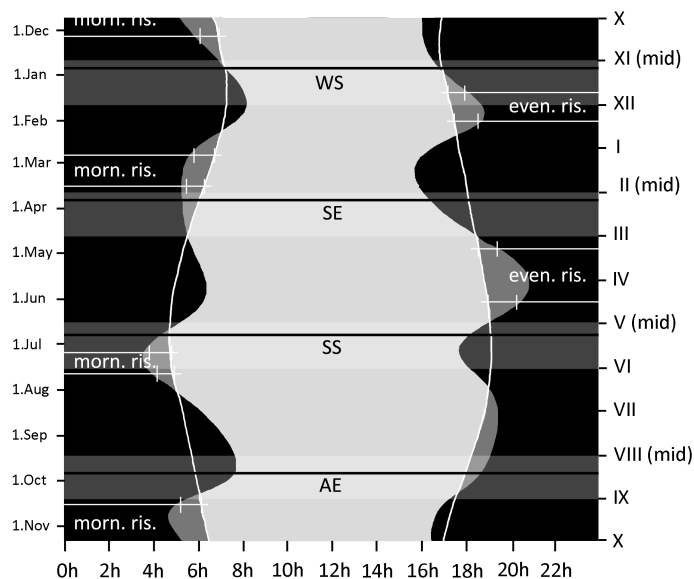
Even with all the philological play afforded by these ambiguities, it is still difficult to map them onto the planet's actual behaviour. Let us take for example the broadest possible interpretation of the aforementioned models: that Mercury *is visible* in the *months* of the solstices and equinoxes in *the quadrant of the sky appropriate to its position vis-à-vis the sun*. This is by no means 'normal' (*chang* 常 or *jing* 經). Mercury's mean synodic period is 115.88 days (cf. Liu Xin's $115\frac{122\,029\,605}{134\,082\,297}$ and Gautama's $115\frac{1168\frac{66}{x}}{1540}$), which means that three of which fall approximately 17½ days short of a solar year, 6 days short of a 12-month civil year, and 36 days short of an intercalary civil year. In other words, the planet's visibility pattern is sliding *ahead* through the solstitial and equinoctial points while the civil months are sliding *around* them. This might still work were the planet visible for most of the year, but Mercury's periods of potential visibility are brief, variable, and staggered in such a manner as is irreconcilable with four consecutive solstitial and equinoctial points (starting with first morning rising, Liu Xin gives 28d/37.9d/26d/24d between first and last visibilities, Gautama gives 30d/33.8d/30d/22d). Factors like weather and eyesight only exacerbate things. Once in a while, as in 203 B.C. (Figure 1), it is true that everything might align such that one could spot Mercury at some point in each of the mid-season months, but this isn't much of a 'pattern' to go on.

Any further condition our sources add to the broad interpretation is asking too much. As Figure 1 shows: periods of potential visibility do not align with the solstitial and equinoctial points; *first visibilities* cannot fall in consecutive mid-season months; and that *neither* occur in *any other month* is unreal. As to position, the Gan De-*Planetary Omina* complex places Mercury's visibility phenomena *at* or *just east of* the solstitial and equinoctial lodges (compare the prior description to Figure 2), which would place the planet too near to the sun to be visible (cf. Liu Xin's angle of invisibility of ≈ 15 *du*) and imply a pattern of

¹⁵Shiji 史記 (Zhonghua shuju ed.), 27.1328.

¹⁶*Kaiyuan zhanjing*, 53.4a.

Figure 1: Rise times and visibility phenomena for Mercury (203 B.C.)



NOTE: Image redrawn from *Planetary, Lunar, and Stellar Visibility* v3.1 (PLSV) for Xi'an 西安 ($34^{\circ}15' N$ $109^{\circ}00' E$) with an arbitrary critical altitude of 1° . The Y-axis is the date, the Roman numerals on the right side indicating the months of the lunisolar civil calendar, and 'mid' indicating mid-season months. The X-axis indicates time of day. The lines running vertically through the diagram indicate the hour of sunrise and sunset as it changes throughout the year. The wobbly area at the center of the diagram represents the time that the planet is above the horizon—the light gray area being time that it is above the horizon *with* the sun (and thus invisible), and the dark gray area the time that it is above the horizon *without* the sun, and thus potentially visible. The short horizontal lines running from the edges of the diagram to the vertical lines of sunrise/sunset indicate the dates of first and last visibilities, as calculated by PLSV. The light horizontal bars indicate the span of the mid-season months. The long black horizontal lines indicate the solstices (S) and equinoxes (E). For example, this diagram tells us that in 203 B.C. FES and FMR might have almost coincided with winter solstice and autumn equinox, respectively, and that the planet was likely visible in the mid-winter and mid-summer months and near the tail end of the mid-autumn month, but probably not in mid-spring.

evening risings at odds with the planet’s synodic period. The Shi Shen-*Records of the Grand Historian* complex is better adapted in this regard, placing the phenomena in multi-lodge spans and alternating between evening and morning visibility. Still, what the latter offers us is conditions the occasional year might fill rather than a description of the planet’s typical behaviour.

The four-season Mercury scheme *is* absurd *as an astronomical model*; rather than dismiss it as such, or pass it off to ignorance, however, we might instead ask what sense it *does* make. As I have discussed elsewhere, the sort of early planetary models we see in *Planetary Omina* are heavily informed by contemporary hemerology (calendar divination).¹⁷ The more sophisticated hemerologies in the Chinese tradition operate by correlatively arranging elements of time and space—the denary and duodenary day-count (S01–10 & B01–12), the seasons, the cardinal directions, the five agents (wood, fire, earth, metal, and water), and the twenty-eight zodiacal lodges (L01–28)—upon a schematized game board through which ontologically ambiguous ‘calendar spirits’ (*shensha* 神煞) cycle and hop with the arbitrary regularity of game pieces, their relative positions determining the auspiciousness of quotidian activities.¹⁸ With the exception of Venus and Mars (being *too well-* and *too poorly-*understood, respectively, to adapt to this purpose), *Planetary Omina* has the planets play out a hemerologically perfect 60-year cycle on just such a game board (Figure 2). Saturn moves anticlockwise one lodge per year, lingering for two in Hall.L13 and Well.L22, making a circuit in 30 years. Each year, Jupiter’s first morning rising moves back one month while the planet moves anticlockwise through the twelve stations (*ci* 次) *to mirror the calendar spirit Taiyin* 太陰, which moves clockwise through the earth.¹⁹ And each year Mercury’s visibility hops through the solstitial and

¹⁷Mo Zihan 墨子涵 (Daniel Patrick Morgan), ‘Cong Zhoujiatai Rishu yu Mawangdui *Wuxing zhan tan rishu yu Qin Han tianwenxue de huxiang yingxiang*’ 從周家臺『日書』與馬王堆『五星占』談日書與秦漢天文學的互相影響, *Jianbo* 簡帛 6 (2011): 113–137.

¹⁸For important Western-language studies on early Chinese hemerology, see Marc Kalinowski, ‘Les traités de Shuihudi et l’hémérologie chinoise à la fin des Royaumes-Combattants’ *T’oung Pao* 2d ser., 72, no. 4/5 (1986): 175–228; ‘The *Xingde* 刑德 Texts from Mawangdui’, trans. Phyllis Brooks, *Early China* 23–24 (1998–99): 125–202; John S. Major, *Heaven and Earth in Early Han Thought: Chapters Three, Four and Five of the Huainanzi* (Albany: State University of New York Press, 1993); Ethan Richard Harkness, ‘Cosmology and the Quotidian: Day Books in Early China’ (Ph.D. diss., University of Chicago, 2011).

¹⁹On the calendar spirit Taisui, the hemerology of its terrestrial movements, and Jupiter’s subordination thereto, see Hu Wenhui 胡文輝, ‘Shi “Sui”—yi Shuihudi Rishu wei zhongxin’ 釋「歲」—以睡虎地『日書』為中心, in *Zhongguo zaoqi fangshu yu wenxian congkao* 中國早期方術與文獻叢考 (Guangzhou: Zhongshan daxue chubanshe, 2000), 88–134; Tao Lei, Huainanzi *Tianwen yanjiu*, 73–97. The *Huainanzi* tells us that “of all the venerable spirits of Heaven none is more venerable than the Green Dragon, which is also called Heavenly Monad or Taiyin” 天神之貴者, 莫貴於青龍, 或曰天一, 或曰太陰 (*Huainan honglie jijie* 淮南鴻烈集解 [Zhonghua shuju ed.], 3.126). According to Li Ling 李零, the ‘Bing bi Taisui’ 兵避太歲 (Weapon to Avoid Taisui) *ge* 戈 dagger-ax discovered in 1960 in a Warring States tomb in Jingmen, Hubei, and the Mawangdui ‘Taiyi bibing tu’ 太一避兵圖 both depict Taisui/Taiyin as a (or all three) dragon assistant(s) to the north pole deity Grand Monad (Taiyi 太一) (“Taiyi” *chongbai de kaogu yanjiu* ‘[太一]崇拜的考古研究, in *Zhongguo fangshu xu kao* 中國方術續考 [Beijing: Zhonghua shuju, 2006], 158–181). On Taisui’s later incarnations as a wriggly lump of meat and a fungus, see Song Huiqun 宋會羣, *Zhongguo shushu wenhua shi* 中國術數文化史 (Kaifeng: Henan daxue chubanshe, 1999), 173–176.

equinoctial corner points. Hour, minute, and second hand, the planets count off the sexagenary year-cycle like clockwork.

It is clear that there is *some* empirical basis for planetary hemerologies, e.g. the sidereal periods of Jupiter (11.86 years) and Saturn (29.46 years), and Jupiter’s roughly 13-month synodic period (398.88 days), but the calendar spirit model for planetary motion and visibility results in outstanding contradictions from the perspective of even early astronomy.²⁰ What *use*, then, is the planet-as-calendar-spirit? The answer, Christopher Cullen has recently suggested, is right there in the omen series in which these models are invariably embedded (and from which, one might add, they are invariably plucked). Likening these to Mesopotamian sources studied by David Brown, Cullen notes that “one of the advantages of schematic depictions of celestial motions is that they automatically generate portents through their divergence from what is actually observed.”²¹ In other words, the four-season scheme for Mercury is a hemerological archetype that our sources transpose upon astronomical phenomena *expecting* the latter to deviate therefrom, the ‘aberration’ (*bu chang* 不常) for which they are prepared falling within the normal range of planetary behaviour (i.e., that Mercury may indeed ‘appear’ in any given month or lodge). It is, therefore, the very ‘absurdity’ of this scheme to which it owes its relevance and utility.

3 The mathematical *li* models

Now that we have made some sense of the early materials, let us turn by way of comparison to the “motion-degree model” (*xingdu* 行度) for Mercury in Liu Xin’s Triple Concordance system.²²

水，晨始見，去日半次。逆，日行二度，一日。始留，二日而旋。順，日行七分度六，七日。順，疾，日行一度三分度一，十八日而伏。凡見二十八日，除逆，定行星二十八度。伏，日行一度九分度七有奇，三十七日一億二千二百二萬九千六百五分，行星六十八度四千六百六十一萬一百二十八分。凡晨見、伏，六十五日一億二千二百二萬九千六百五分，行星九十六度四千六百六十一萬一百二十八分。夕始見，去日半次。順，疾，日行一度三分度一，十六日二分日一。順，遲，日行七分度六，七日。留，一日二分日一而旋。逆，日行二度，一日而伏。凡見二十六日，除逆，定行星二十六度。伏，逆，日行十五分度四有奇，二十四日，行星六度五千八百六十六萬二千八百二

²⁰On the case of Jupiter and Saturn in the *Planetary Omina*, see Morgan, ‘The Planetary Visibility Tables in the Second-Century BC Manuscript *Wu xing zhan*’.

²¹‘Understanding the Planets in Ancient China’, 248–249. Cullen cites Brown’s *Mesopotamian Planetary Astronomy-Astrology* (Groningen: Styx, 2000) as his inspiration.

²²On the Triple Concordance system and its planetary astronomy, see Nōda Chūryō 能田忠亮 and Yabuuti Kiyosi, *Kansho ritsurekishi no kenkyū* 漢書律曆志の研究, Tōhō bunka kenkyūjo kenkyū hōkoku 19 (Tōkyō: Zenkoku shobō, 1947); Teboul, *Les premières théories planétaires chinoises*. Later writers treat Liu Xin’s work as a revision of the Grand Inception system rather than a standalone system; his basis in its lunar and solar parameters is clear, but there is no evidence concerning what if any planetary knowledge it contained, leaving us to assume that the Triple Concordance system’s planetary astronomy is Liu Xin’s innovation.

Figure 2: *Wuxing zhan* planetary hemerology (year 1 of 60)

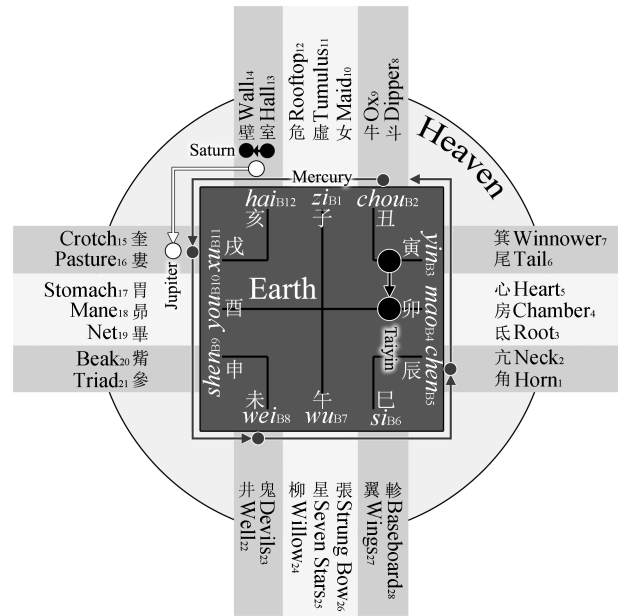
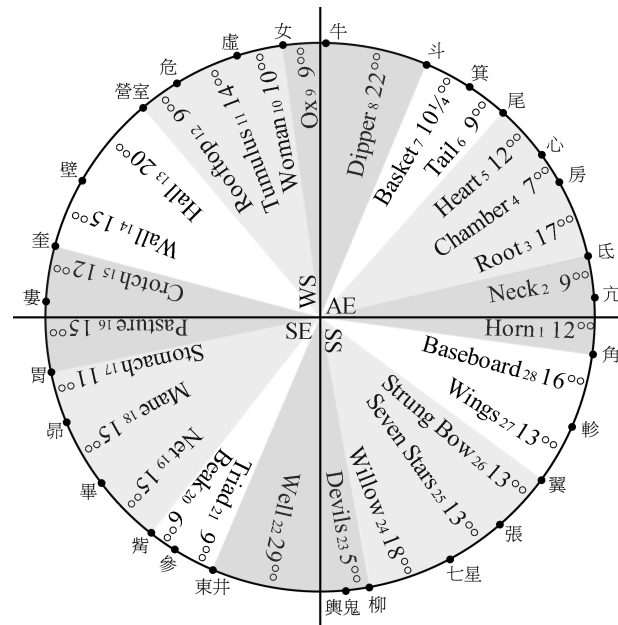


Figure 3: The twenty-eight lodges 'ancient *du* widths'



十分。凡夕見伏，五十日，行星十九度七千五百四十一萬九千四百七十七分。一復，百一十五日一億二千二百二萬九千六百五分。行星亦如之，故曰日行一度。

Mercury: First morning visibility at half a station (15°) from the sun. Retrograde: 2 *du* per day, 1 day. First station: 2 days, then circles back. Prograde: $6/7$ *du* per day, 7 days. Prograde fast: 1 *du* & $1/3$ *du* per day, then hides (sets). Visible for a total of 28 days, and, retrograde aside, travels a fixed 28 *du* through the stars. Hidden (last morning rising): 1 *du* & $7/9$ plus change *du* per day, 37 days & 122 029 605 parts (of 134 082 297), travels 68 *du* & 46 610 128 parts through the stars. First evening visibility at half a station from the Sun. Prograde fast: 1 *du* & $1/3$ *du* per day, 16 days & $1/2$ day. Prograde slow: $6/7$ *du* per day, 7 days. Station: 1 day & $1/2$ day, then circles back. Retrograde: 2 *du* per day, 1 day, then hides. Visible for a total of 26 days, and, retrograde aside, it travels a fixed 26 *du* through the stars. Hidden in retrograde (last evening setting): $4/15$ plus change *du* per day, 24 days, travels 6 *du* & 58 662 820 parts through the stars. Evening visibility and hidden for a total of 50 days, travels 19 *du* & 74 419 477 parts through the stars. One cycle: 115 days & 122 029 605 parts. Travel through the stars [in *du*] is the same, thus we say [its average motion is] 1 *du* per day.²³

As we can see in Table 1, the Triple Concordance *li* model divides the planet's 115.9-day synodic period into morning and evening halves, each half being comprised of five more-or-less symmetrical grades. The grades are anchored to the planet's visibility phenomena—first and last morning risings (FMR/LMR) and evening settings (FES/LES)—and described the planet's mean speed and distance travelled over a fixed number of days. Apparent travel is measured in *du* of right ascension, one *du* being the distance travelled by the (mean) sun in one day (above). From FMR to LMR, and from FES to LES, the planet appears half a station ($1/24$ the circumference of heaven, i.e. 15°) from the sun, moves outward, then back, and disappears again at the same distance from the sun. As a result, the planet travels the same distance in *du* as does the sun from FMR to LMR, from FES to LES, and from FMR to FMR; and since the distance travelled by the sun is, by definition, equal to the number of days travelled, so too does the days travelled and *du* travelled by the planet equal one another over these periods. When the planet is invisible around superior and inferior conjunction, on the other hand, it must travel a number of *du* equal to the number of days *plus or minus one station* to appear on the other side of the sun.²⁴

It is fair to say that the Triple Concordance motion-degree model is *crude*. After all, it plots motion along the equator (i.e., in right ascension), and it

²³*Han shu*, 21B.1000.

²⁴For a lucid explanation of these principles, see Teboul, *Les premières théories planétaires chinoises*, 51–79.

Table 1: Triple Concordance motion-degree model for Mercury (c. A.D. 5)

Grade		Du per day	Days	Du travelled
MORNING				
1	FMR, Retrograde	-2	1	-2
2	First station	0	2	0
3	Prograde	$\frac{6}{7}$	7	6
4	Prograde fast	$1\frac{1}{3}$	18	24
5	Hidden (at LMR)	$> 1\frac{7}{9}$	37	68
			$\frac{122\ 029\ 605}{134\ 082\ 297}$	$\frac{46\ 610\ 128}{134\ 082\ 297}$
EVENING				
6	FES, prograde fast	$1\frac{1}{3}$	$16\frac{1}{2}$	22
7	Prograde slow	$\frac{6}{7}$	7	6
8	Station	0	$1\frac{1}{2}$	0
9	Retrograde	-2	1	-2
10	Hidden, retrograde	$> \frac{4}{15}$	24	-6
			$\frac{58\ 662\ 820}{134\ 082\ 297}$	$\frac{58\ 662\ 820}{134\ 082\ 297}$
TOTAL		1	115	115
			$\frac{122\ 029\ 605}{134\ 082\ 297}$	$\frac{122\ 029\ 605}{134\ 082\ 297}$

NOTE: Grey cells indicate values not supplied by the text itself. $>$ signifies ‘plus change’ (*you qi* 有奇).

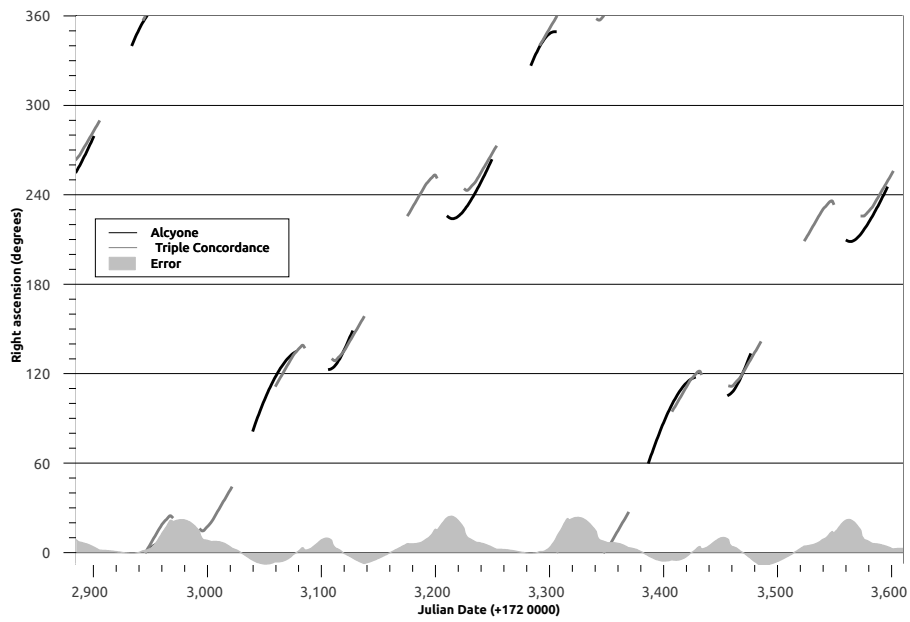
fails to compensate for the considerable eccentricity of the planet’s motions, the variability of its greatest elongation, or the seasonal variability its visibility phenomena. The result, in terms of what our historical subjects were looking for from such models, is that it produces errors upwards of 30° in right ascension and misses expected visibility phenomena by upwards of 10 days at epoch (Figure 4). It was sufficiently crude, at least, in the eyes of Liu Xin’s predecessors for them to set upon improving it right away, introducing quantitative, theoretical, and algorithmic improvements to his framework over the subsequent centuries.²⁵ That said, it would be difficult to accuse the early *li* model of being *absurd*: it was, as Figure 4 shows, clearly onto something.

4 The history of post-*li* planetary hemerology

Whether hemero-omenological *tian-wen* models *developed into* mathematical *li* models, or whether the latter *evolved from* the former, is probably the wrong question to be asking. Aside from the incommensurability of context, developmental continuity is, at very least, a matter this author has no idea how to prove. A better question might whether the one model *replaced* the other. This it did

²⁵On planetary astronomy in later systems, see Qu Anjing 曲安京, *Zhongguo shuli tian-wenxue* 中國數理天文學, Shuxue yu kexue shi congshu 4 (Beijing: Kexue chubanshe, 2008), 532–628. For a look at what these models would become at their high point, see Sivin, *Granting the Seasons*, 516–550.

Figure 4: *Li* model prediction of position and visibility for A.D. 5–6



NOTE: The Alcyone line was computed using *Alcyone Ephemeris* v3.2, the breaks representing periods of invisibility as calculated by PLSV. The latter should be treated as a rough estimation, since here are numerous factors determining a planet's visibility that are beyond our ability to mathematically model. The Triple Concordance line was computed by the author using the instructions of the extant *li* manual, the results of which—*du* travelled from a fixed winter solstice point of Ox-L09/28 0 (β Cap)—were converted into degrees of right ascension travelled from said star and, from there, into right ascension.

not. By my accounting, variations on the four-season scheme appear in no less than twenty-six sources spanning a period of 900 years. The nature of *tian-wen* omen literature makes it difficult to establish concrete dates and provenances for many of these sources: it is a genre within which anonymity, pseudepigraphy, and borrowing is rampant, and in which the majority of sources survive only in citation, manuscripts of questionable origin, or both. That said, titles, bibliographies, and plausible attestations offer us a number of clues sufficient to establish a rough chronology, which I offer in Table 2.

The fact that people continued to *copy* planetary hemerologies over this period tells us very little about their viability as living knowledge. For sure, Gautama copied them, but his attitude was more that of a collector intrigued by old and ridiculous curios in need of conservation. How long before his day was it, we might ask, that these models made the transition from fact to artefact? Let's set a lower limit: A.D. 479 February 24. It is on this date that the *Book of Southern Qi's tian-wen* treatise records an omen reading made on the basis of our four-season Mercury model that was memorialised to sanction Xiao Daocheng's 蕭道成 (A.D. 427–482) assumption of the throne from the last Liu-Song 劉宋 (A.D. 420–479) emperor that very year:

昇明三年正月十八日，辰星孟効西方。占曰『天下更王』。

[Song Shundi 順帝], Rising Enlightenment 3–I–18 (A.D. 479 February 24): the Chronogram Star appeared in the west in the first month of the season. The omen interpretation states: “the sub-celestial realm will change kings.”²⁶

This is the last of six extant records in the standard histories in which where the un-hemerological behaviour of Mercury is noted and interpreted. The others are concentrated in and around the Han. The first is Liu Xiang's 劉向 (79–8 B.C.) recollection that, amid other omens, “the Chronogram Star emerged in the four first months of the seasons” 辰星出於四孟 during the reign of Qin Ershi 秦二世 (209–207 B.C.) to presage the fall of the Qin 秦 (221–206 B.C.).²⁷ The second is yet another later recollection of the same phenomenon but in 204 B.C. and presaging, this time, the Han conquest of Chu two years later.²⁸ The third is a record Mercury's early appearances on 1-IV-*renxu*.⁵⁹ (73 B.C. May 9) and 2-VII-*xinhai*.⁴⁸ (72 B.C. Aug 16 ?) of Han Xuandi's 宣帝 Foundational Beginning reign (73–70 B.C.) as presaging the execution of an unnamed minister.²⁹ The fourth is a vague description of Mercury having “not appeared in a long time” 久而不効 and “missed the mark of its calculated position” 失行筭度 in the years

²⁶ *Nan Qi shu* 南齊書 (Zhonghua shuju ed.), 12.204.

²⁷ *Han shu*, 36.1965; *Shuoyuan* 說苑 (Siku quanshu ed.), 18.3a–b.

²⁸ *Han shu*, 26.1302.

²⁹ *Ibid.*, 26.1308. 2-VII began on *jiayin*.⁵¹ (72 B.C. August 24), placing *xinhai*.⁴⁸ at the end of month VI, meaning that either the month or the sexagenary day is incorrect. PLSV confirms that Mercury, which was setting around 50 min after the Sun, could have conceivably been visible around this time. Since the text describes this emergence as “early” (*zao* 早)—i.e. in the first month of autumn (month VII) rather than the last month of summer (month VI)—I suspect that it is the sexagenary day that is incorrect.

Table 2: Four-season schemes for Mercury in *tian-wen* omen literature

no.	Author	Text	Date	Extant/Cite
1	Wuxian 巫咸?	anon.	?	KYZJ 53.4.8-9,10
2	Shi Shen 石申?	anon.	?	KYZJ 53.4.8
3	Gan De 甘德?	anon.	?	KYZJ 53.4.8
4	anon.	<i>Wuzing zhan</i> 五星占	168 B.C.	MS
5	Liu An 劉安 et al.	<i>Huainanzi</i> “Tianwen xun” 淮南子·天文訓	139	extant
6	Sima Qian 司馬遷	<i>Shiji</i> “Tianguan shu” 史記·天官書	91	extant
7	Li Shuo 李朔?	<i>Wuling ji</i> 五靈紀	W. Han?	TWYL 10.1b-2a
8	Liu Xiang 劉向	<i>Hongfan zhuan</i> 洪範傳	1st cent.	KYZJ 53.2-3,9
9	Li Xun 李尋	petition	c. 6	<i>Book of Han</i> , 75.3187
10	anon.	<i>Chunqiu weft</i> 春秋緯	1st cent. A.D.	KYZJ 53.3,8
11	anon.	<i>Kaolingyao</i> 考靈耀	1st cent.	KYZJ 53.8
12	anon.	<i>Luo shu</i> 洛書	1st cent.	KYZJ 53.3
13	anon.	<i>Shangshu weft</i> 尚書緯	1st cent.	KYZJ 53.4
14	anon.	<i>Yuanmingbao</i> 元命包	1st cent.	KYZJ 53.8
15	anon.	<i>Yuanshengqi</i> 元神契	1st cent.	KYZJ 53.4
16	anon.	<i>Haizhong zhan</i> 海中占	1st cent.?	KYZJ 53.9
17	Ban Zhao 班昭	<i>Han shu</i> “Tianwen zhi” 漢書·天文志	111	extant
18	Liu Biao 劉表 & Liu Rui 劉叡	<i>Jingzhou zhan</i> 荊州占	2nd cent.	KYZJ 53.2,9-10
19	Huangfu Mi 皇甫謐	<i>Nian li</i> 年曆	3rd cent.	KYZJ 53.4
20	Jin Zhuo 晉灼	commentary	4th cent.?	<i>Shiji</i> , 27.1372
21	Li Chunfeng 李淳風	<i>Sui shu</i> “Tianwen zhi” 隋書·天文志	641-656	extant
22	Li Chunfeng	<i>Jin shu</i> “Tianwen zhi” 晉書·天文志	646/8	extant
23	anon.	P.2811	Tang?	MS
24	Puyang Xia 濮陽夏?	<i>Qiaozhi wuzing zhi</i> 譙子五行志	Tang	extant
25	Li Feng 李鳳?	<i>Tianwen yaolu</i> 天文要錄 (TWYL)	664	extant
26	Gautama Siddhartha 瞿曇悉達	<i>Kaiyuan zhanjing</i> 開元占經 (KYZJ)	729	extant

leading up to the Nanyang rebellion of A.D. 30 in the context of a letter written by Su Jing 蘇竟 to dissuade a friend from joining the rebels.³⁰ The fifth is a record of the planet having “appeared before it ought to appear” 未當見而見 in Han Guangwudi 光武帝 30-IV²-*jiawu*.³¹ (A.D. 54 June 09), whereupon it turned into a comet and presaged a devastating flood and, three years later, the death of Guangwudi himself.³¹

There is a lot we might think to demand of these records. Were the phenomena real, or hoaxes perpetrated for political ends? Were the omen interpretations (*zhan* 占) and correspondences (*ying* 應) contemporaneous with observation/fabrication, or the products of later imaginations? Furthermore, given the frequency with which the planet violates the hemerology, what does the number of these records say about the selectiveness of the practice of *tian-wen* divination and/or *tian-wen* monograph compilation? These are good questions around which a significant body of secondary literature has developed;³² they are, on the other hand, besides the point. However selective, biased, or disingenuous these records may be, they confirm a chronology of credibility: that planetary hemerologies saw use in *some* application of *tian-wen* omen reading; that intellectuals—*tian-wen* experts, statesmen, and historians—continued to apply them centuries after the emergence of mature *li* models; and that they possessed sufficient intellectual currency in A.D. 479 to inform the Qi court’s legitimation strategy and, once again, *circa* A.D. 537 when Qi scion Xiao Zixian 蕭子顯 (A.D. 489–537) wrote it into their standard history.

So, the four-season Mercury model was alive in practice, but how about in theory? In the genre of theoretical/practical omen literature, we see so much variation between individual models and omen series as to suggest that practitioners continued to tweak and expand the rules of the model well into the first millennium A.D. As we will recall from above, the models follow the same form but feature different verbs, dates, lodges, and sequences of morning/evening visibility. Likewise, the omen series all agree on the fundamentals: under normal circumstances, Mercury rises or is visible around the solstices and equinoxes; doing so, it rectifies the agricultural order, while failing to do so signals immanent

³⁰*Hou Han shu*, 30A.1043–1044.

³¹*Ibid.*, *zhi* 10, 3223.

³²On the sources, veracity, political manipulation, and historiographical functions of omen records, see, for example, Hans Bielenstein, ‘An Interpretation of the Portents in the *Ts’ien-Han-Shu*’, *Bulletin of the Museum of Far Eastern Antiquities* 22 (1950): 127–143; Wolfram Eberhard, ‘The Political Function of Astronomy and Astronomers in Han China’, in *Chinese Thought and Institutions*, ed. John Fairbank, Comparative Studies of Cultures and Civilizations (Chicago: University of Chicago Press, 1957), 37–70; Rafe De Crespigny, *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); Martin Kern, ‘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; Huang Yi-long 黃一農, *Shehui tianwenxue shi shi jiang* 社會天文學史十講 (Shanghai: Fudan daxue chubanshe, 2004), 1–92. I plan tackle these questions as concerns Li Chunfeng’s 李淳風 (A.D. 602–670) compilation of the *Book of Sui* and *Book of Jin* monographs in a chapter in ‘Heavenly Patterns’, in Damien Chaussende et al., ed., *Monographs in Tang Official Historiography: Perspectives from the Technical Treatises of the Book of Sui* (forthcoming).

disaster for agriculture, the populace, and the state (being the ‘water planet’, Mercury-related catastrophes often involve water); and this is so because the planet’s timeliness is correlatively bound up in the timeliness and propriety of government action. Our sources, however, develop upon these fundamentals with different apodoses and different levels of specificity concerning the protases (see Table 3). Is the time right or wrong? If wrong, is it early or late? What about the lodge? In which season is it off? For how many seasons is it off? Between the the model and the omen series, we find just about every conceivable permutation across our sources, no two of which are quite the same. At one point I compiled these permutations into a spreadsheet with the hope of revealing patterns of filiation and development between them, but this proved pointless: the permutations are simply too random (see Table 4), the result, the author imagines, of concerted innovation by generations of practitioners.

5 The death of the hemerological planetary model

We have shown there to have been plural traditions of planetary model operative at the same time, but serving different practices, questions, and professions, which is an important step for a field that tends to talk in terms of monolithic traditions. It is crucial, in my opinion, that we continue to break ‘the Chinese tradition’ down into a more human scale, down to the level of the tools, the practices, the questions, the individuals and collectives involved in their pursuit, and the private and institutional contexts in which these pursuits were carried out. We can not easily leave things here, though, because the question of plurality raises the equally engaging question of dialogue.

Let us recollect our historical scope: we know *tian-wen* planetary models to have coexisted as living knowledge with *li* from at least A.D. 5 to A.D. 537 before dropping out of practical *tian-wen* literature as ‘absurd’ ‘old’ curios by Gautama’s time in the eighth century. So, what was it that happened between the sixth to eighth centuries A.D.? One thing that happened was that *li* experienced something of a revolution with Zhang Zixin’s 張子信 (fl. A.D. 526–576) introduction of solar and planetary equations of center and algorithms for the seasonal variability of visibility phenomena, which his more politically stalwart disciples Zhang Mengbin 張孟賓 and Liu Xiaosun 劉孝孫 (d. A.D. 632) would spend decades bringing into the mainstream.³³ It just so happens that we see dramatic changes in *tian-wen* at around the same time. Beginning with Xiao Zixian’s *Book of Southern Qi* of circa A.D. 537, we see a shift in the organization of *tian-wen* monograph astronomical records from the court—one court, one chronicle—to omen typology—one phenomena-class, one chronicle. These typologies, it is worth noting, coincide quite neatly with phenomena that we

³³On Zhang Zixin and the eventual implementation of his techniques into official *li*, see Chen Meidong 陳美東, *Zhongguo kexue jishu shi: tianwenxue juan* 中國科學技術史：天文學卷 (Beijing: Kexue chubanshe, 2003), 298–303; Chen Jiujin 陳久金, ed., *Zhongguo gudai tianwenxuejia* 中國古代天文學家, *Zhongguo tianwenxueshi daxi* (Beijing: Zhongguo kexue jishu chubanshe, 2008), 186–196; Zhang Peiyu et al., *Zhongguo gudai lifa*, 425–457.

Table 3: Mercury four-season omen series

no.	Protasis	Apodosis
1a 1b	If it does not rise when it ought to	armies arise [the state] pursues armies abroad but does not engage them in battle.
2	If it rises when it ought not to	cold/hot inversion, general environmental collapse
3	If it rises in the four mid-season months	the world is at peace/harmony
4	If it rises between Heart.L04 and Chamber.L05	earthquake
5	If it does not rise in the four mid-season months	disasters, famine, crop failure, yin-yang out of control, state collapse, seasonal disturbances, people injured, and lord and minister in disharmony
6a 6b	If it rises early/in the four first-months	regime change lunar eclipse
7a 7b 7c	If it rises late/in the four last-months	comet, demonic celestial portents, state collapse army broken, general killed marquis do not report in
8a 8b	If it does not rise for (1) one or (4) any season	(1) said season disadvantageous/disharmonious, (4) famine (4) cold/hot inversion
9	If it does not rise for one, two, three, or all four seasons	(1) said season in disharmony, armies arise; (2) said seasons in disharmony and/or a flood; (3) said seasons in disharmony and a big military uprising; (4) famine, dam breach and flood killing the populace and/or comet in the east
10a 10b	If it does not appear in a specific season or none at all ... and it does not appear in correct lodge	(spring): 100 days of violent wind and rain, harming sprouts; (summer): drought, famine, 90 days of population displacement; (autumn): 60 days of floods; (winter): five grains not stored, population death and displacement; (None): river and sea waves, comet. (Seasons): same as above. (Lodges): crops damaged
11	If punishments and rites are not in proper order	Mercury does not rise on time, there are seasonal disturbances (leading to 2 and 3 above)
12	If government is (1) fast, (2) slow, or (3) stalled	(1) mercury is fast, (2) slow, or (3) hides and transforms into a comet
13	If there is a mistake in (civil) administration in winter	Mercury does not appear at the correct time / in the correct direction

Table 4: Mercury model & series permutations

no.	Model				Omen formulae																		
	time	seq.	verb	L	1a	1b	2	3	4	5	6a	6b	7a	7b	7c	8a	8b	9	10a	10b	11	12	13
1	m	-	出	A							X		X		X			X	X	X			
2	m+S/E	EEEM	出	D	X					X	X												
3	S/E	-	效	A																			
4	S/E	-	效	A			X	X		X	X	X				X							
5	m+S/E	-	効	C												X							
6	m+S/E	EEEM	出郊	D	X			X			X	X				X							
7	S/E+1d	MMEE	見	B																			
8	m						X		X	X													
9	m									X		X										X	
10	S/E	EEEM	出	-		X												X					
11	ssn																						X
12	S/E+1d	MMEE	見	B																			
13	ssn																				X		
14	ssn																						X
15	m							X															
16	m										X	X											
17	ssn				X	X										X							
18	m	-	出	A			X	X		X	X							X	X	X			
19	m+S/E	EEEM	効	C																			
20	m+S/E	-	見	C																			
21	ssn				X	X										X							
22	ssn				X	X	X									X							
23	m+S/E	EEE?	出	D																			
24	m				X	X				X			X			X	X						
25																							
26																							

LEGEND: ‘No.’ refers to the source numbers on Table 2. Under ‘time’, ‘m’ = (mid-season) month, ‘S/E’ = solstices and equinoxes, and ‘S/E+1d’ = within two days of the solstices and equinoxes. Under ‘seq.’, ‘M’ = morning, and ‘E’ = evening. Under ‘L’, we have the following lodge sequences: A = 16 → 23 → 02 → 09; B = 15 → 22 → 03 → 10; C = 15 & 16 → 22 → 1 & 2 → 8 & 9; D = several lodges east/west of the sun (for lodge numbers, see Table 2). For the omen series, see Table 3.

today would expect (if not worry ourselves about) from celestial bodies;³⁴ there are, historically, very few records of planets “going off course” (*shi du* 失行), but where there are, after A.D. 479, it is clear that the norm by which we judge deviation is no longer the calendar spirit archetype. This change roughly coincides with a parallel trend in the compendia, where we see elite compilers begin to replace the old-style hemerological models and omen series with computational *li* models. We see this first with Yu Jicai’s 庾季才 (A.D. 516–603) *Secret Garden of the Observatory* (*Lingtai miyuan* 靈臺秘苑) of circa A.D. 580, then again in Li Chunfeng’s 李淳風 (A.D. 602–670) *Yisi zhan* 乙巳占 of A.D. 656, and, by point of criticism (above), in Gautama’s *Kaiyuan Omen Classic*.³⁵

Something happened in the sixth century A.D., it would seem, something big. Jiang Xiaoyuan 江曉原 once suggested that we might someday uncover evidence of Indian influence upon Zhang Zixin’s work—an influence prior to the days of the seventh and eighth century A.D., when Indian lineages like the Gautamas came to run the Tang astronomical office, that might help explain the one-century disconnect between the revolution in *li* and the sudden foothold of foreign experts thereupon.³⁶ It is a compelling thought, but nothing of Zhang’s work survives, and it is difficult to imagine anyone more isolated from outside influence than the man who “went into hiding on a sea island for more than thirty years were he devoted himself to the observation via armillary sphere of data on the differences and changes in the sun, moon, and [planets]” 隱於海島中，積三十許年，專以渾儀測候日月五星差變之數。³⁷ But what happened in the sixth century, more to the point, was something bigger than just *li*, it was something that left the course of *both* astral sciences permanently altered.

We have, to be fair, painted too neat a picture thus far: it is not as if *tian-wen* and *li* existed in total isolation up to some hypothetical point of singularity

³⁴In the case of planets, for example, we have ‘encroachment’ (*fan* 犯), ‘occultation’ (*yan* 掩), ‘holding’ (*shou* 守) in station, ‘daylight visibility’ (*zhou xian* 晝見), ‘conjunction’ (*he* 合), and ‘amassing’ (*ju* 聚). On *tian-wen* omen terminology, see Ho Peng Yoke, *The Astronomical Chapters of the Chin Shu*, 21, 34–41; Zhuang Weifeng 莊威鳳, *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), 122–123, 128–131.

³⁵See *Lingtai miyuan* 靈臺秘苑 (Siku quanshu ed.), j. 9; *Yisi zhan* 乙巳占, j. 4–6 in Bo Shuren 薄樹人 ed., *Zhongguo kexue jishu dianji tonghui: tianwen juan* 中國科學技術典籍通彙·天文卷, 8 vols. (Zhengzhou: Hebei jiaoyu chubanshe, 1993), vol. 4, pp. 505–534; *Kaiyuan zhanjing*, j. 23.2b–3a, 30.4a–b, 38.2b–3a, 45.2b, 53.3a (commentary). Note that Yu Jicai’s work underwent significant changes in the eleventh century, when Wang Anli 王安禮 (A.D. 1034–1095) et al. redacted it from 120 or 115 *juan* 卷 (*j.*) to 15 and added contemporary observational data to it. On this, see *Qianding Siku quanshu zongmu* 欽定四庫全書總目 (Siku quanshu ed.), 108.27b–29a. Pan Nai 潘鼐, *Zhongguo hengxing guance shi* 中國恆星觀測史 (Shanghai: Xuelin chubanshe, 1989), 190. The fact, however, that the *Secret Garden of the Observatory*’s planetary models are corrupt and look very much like those of the *Yisi zhan* and *Kaiyuan Omen Classic*, however, suggests to the author that they are original; even if they are not, however, they are simply a *later* example of the same trend. I explore the question of change in *tian-wen* literature in further depth in Morgan, ‘Heavenly Patterns’.

³⁶*Tianxue zhen yuan* 天學真原 (Shenyang: Liaoning jiaoyu chubanshe, 1991), 383. The question of foreign influence on Zhang Zixin’s work is pursued in Niu Weixing, *Xi wang Fantian: Hanyi Fojing zhong de tianwenxue yuanliu*, 162–175. On the introduction of Indian astronomy into China, see Note 8.

³⁷*Sui shu*, 20.561.

in the sixth to eighth centuries A.D. First of all, the fact of the matter is that the four-season model for Mercury continues to appear in post-sixth-century texts. Some of these, like the *Kaiyuan Omen Classic* and Li Chunfeng's *Book of Sui* and *Book of Jin* monographs, are academic compilations with a clear historical bent (with remarks upon the limits of ancient knowledge). Still others, however, present themselves as simple collections of facts about heaven, e.g. the anonymous Dunhuang manuscript P. 2811 and the problematic *Master Qiao's Five-agents Monograph* (*Qiaozi wuxing zhi* 譙子五行志) (sources 23 & 24 on Table 2), and, beyond the scope of Table 2, works of textual scholarship with a classicist bent, for whom the ancient bears repeating, like the *History of Song* monograph (A.D. 1346) and Ming Renzong's 明仁宗 (r. A.D. 1424–1425) *Heavenly Epoch Jade li Auspices & Oddities Rhapsody* (*Tianyuan yuli xiangyi fu* 天元玉歷祥異賦) of 1425 (both heavily informed by Li Chunfeng).³⁸ If we are to maintain some sort of sixth-century singularity event we must, therefore, make a distinction between 'expert' and 'non-expert' (or 'popular') manifestations of the astral sciences in China.

Second, Gautama Siddhārtha was not the first to criticize the *tian-wen* models; the history of such criticism, in fact, goes back to the very beginnings of the astral sciences. In the first century B.C., for example, Sima Qian criticizes (two of) the Three Experts for misunderstanding what constitutes meaningful anomaly:

故甘、石曆五星法，唯獨熒惑有反逆行；逆行所守，及他星逆行，日月薄蝕，皆以為占。... 余觀史記，考行事，百年之中，五星無出而不反逆行，反逆行，嘗盛大而變色... 此其大度也。... 水、火、金、木、填星，此五星者，天之五佐，為(經)緯、見伏，有時，所過行贏縮有度。... 凡天變，過度乃占。

In the old Gan [De] and Shi [Shen] methods for *li*-computing the [planets] only [Mars] had retrogradation. They took the [asterisms] it guards in retrograde, the retrogradation of other [planets], and the veilings and eclipses of the Sun and Moon all as the objects of omen-interpretation. ... I have looked at the clerk's [historical] records and investigated phenomena as they happen, and [I discovered that] in a hundred years the five [planets] have never once emerged without going into retrograde; and when they retrograde they invariably become grand and change color... this is their great *du* (measure/norm). ... [Mercury], [Mars], [Venus], [Jupiter], and [Saturn]—these five stars are the five assistants of Heaven. As for their actions in warp and weft (i.e., declination and right ascension), and their appearance and hiding, [everything] has its time, and the gain and retreat by which they exceed their [expected] travels have

³⁸See, specifically, *Qiaozi wuxing zhi* 譙子五行志, 5.2b in Gao Keli 高柯立, *Xijian Tangdai tianwen shiliao san zhong* 稀見唐代天文史料三種, 3 vols. (Guojia tushuguan chubanshe, 2011), vol. 3, 726; *Song shi* 宋史 (Zhonghua shuju ed.), 52.1074; *Tianyuan yuli xiangyi fu* 天元玉歷祥異賦, in *Zhongguo kexue jishu dianji tonghui: tianwen juan*, vol. 4, 771.

their norms... With celestial incidents, one only performs omen interpretation when they have exceeded their norms.³⁹

This rather lengthy criticism occurs at the end of his ‘Heavenly Offices Monograph’, one of the first and most important entries in the *tian-wen* genre. Sima Qian is quite serious in his devotion to omenology, including the four-season model for Mercury (which appears quite developed in his monograph), it is simply that his seriousness demands that he address manifest absurdities in what constitutes normal (*chang*) behaviour via the accumulated observational experience to which he was privy.

The author of the *Book of Han* monograph takes a different approach,⁴⁰ attempting instead to rationalize Gan De and Shi Shen’s planetary models in terms of the fall of man:

古曆五星之推，亡逆行者，至甘氏、石氏經，以熒惑、太白為有逆行。夫曆者，正行也。古人有言曰：「天下太平，五星循度，亡有逆行。日不食朔，月不食望。」... 熒惑主內亂，太白主兵，月主刑。自周室衰，亂臣賊子師旅數起，刑罰失中... 故二星與月為之失度，三變常見... 甘、石氏見其常然，因以為紀，皆非正行也。詩云：「彼月而食，則惟其常；此日而食，于何不臧？」詩傳曰：「月食非常也，比之日食猶常也，日食則不臧矣。」謂之小變，可也；謂之正行，非也。故熒惑必行十六舍，去日遠而顛恣。太白出西方，進在日前，氣盛乃逆行。及月必食於望，亦誅盛也。

The calculation of the five [planets] in ancient *li* lacked retrogradation until Mr. Gan & Mr. Shi’s canons, which ascribed it to [Mars] & [Venus]. *Li* is a matter of proper/forward behaviour. The ancients had a saying that “When the sub-celestial realm is in grand peace, the five [planets] obey their *du*/norms without retrograding; the sun neither eclipses at new moon, nor the moon at full moon.” ... [Mars] governs internal strife, [Venus] governs soldiers, and the moon governs punishment. Ever since the decline of the house of Zhou (in 771 B.C.), rebellious ministers and traitors have led armies in numerous uprisings, and punishments (i.e., the law) have missed the mark... and thus it is that the two [planets] and the moon miss their *du*/norms and the three (aforementioned) incidents are normally (*chang*) seen... Gan & Shi saw that this was normally (*chang*) so and, therefore, took it as a cycle, *but none of this is proper behaviour*. The *Odes* say, “That the moon there be eclipsed, is but

³⁹ *Shiji*, 27.1349–1351.

⁴⁰ The authorship of the *Book of Han* ‘Heavenly Patterns Monograph’ is a perplexing problem. Beginning with the *Book of Later Han*, subsequent *tian-wen* monographs attribute its authorship to Ma Xu 馬續 (fl. A.D. 119–141) (see *Hou Han shu*, *zhi* 10, 3215; *Jin shu* 晉書 [Zhonghua shuju ed.], 11.278). Elsewhere, however, the treatise is attributed both to Ban Zhao 班昭 (c. A.D. 45–c. 117) and to Cai Yong 蔡邕 (A.D. 133–192) and Qiao Zhou 譙周 (A.D. 199–270) (see, respectively, *Hou Han shu*, 84.2784 and *ibid.*, *zhi* 10, 3215 [commentary]). On the composition of the *Book of Later Han* treatises, with comments on their predecessors, see B. J. Mansvelt Beck, *The Treatises of Later Han: Their Author, Sources, Contents, and Place in Chinese Historiography* (Leiden: E.J. Brill, 1990), esp. 56–63.

normal of its travel; but should the sun there be eclipsed, oh, what horrors do unravel?” (‘Shiyue zhi jiao’ 十月之交). [But], the (commentary) tradition to the *Odes* states that “Lunar eclipses are not ‘normal’; but they are *more* ‘normal’ in comparison to solar eclipses, [which is why] it is solar eclipses that are ‘horrible.’” To refer to this as a ‘small incident’ is fine, but not ‘proper behaviour’. Thus, [Mars] necessarily goes off and does as it pleases after travelling sixteen lodges and placing itself at a distance from the sun; and [so too] for Venus [when] it emerges from the west and advances right up to the sun, retrograding in the flourish of *qi*; and [so too], also, when we come to the moon, which necessarily eclipses at new moon as executions too flourish.⁴¹

In a brilliant exercise of word play and classical scholarship, the *Book of Han* monograph offers us a way to reconcile the truth of experience with the truth of ancient textual authority: to distinguish between what is ‘normal’ and what is ‘proper’ for planets to do. This conceit may well have relieved a certain degree of cognitive dissonance among men learned in both sciences.

Still, something has changed. We are a long ways here from the world of anonymous free-floating facts listed, borrowed, and developed upon in early and/or ‘popular’ technical literature. We are dealing, instead, with *positions*, which our monograph authors attribute with increasing clarity to historical figures and to the books, like them, that they supposedly authored—positions formed in a historical context for historical reasons (be it *li*-ological ignorance or political moralism) in need of historical elucidation. What is more, even their apologists cannot help but frame the matter in terms of *li*—“The calculation of the five [planets] in ancient *li*...”—placing the *tian-wen* model in an awkward (and unsustainable) position.

In the next standard history monograph to offer a catalogue of omnia, the *Book of Sui* ‘Heavenly Patterns Monograph’ (A.D. 636), Li Chunfeng likewise inserts himself into the body of the catalogue to address the problem of old fashioned planetary models, framing them, likewise, in terms of *li*:

古曆五星並順行，秦曆始有金火之逆。又甘、石並時，自有差異。漢初測候，乃知五星皆有逆行，其後相承罕能察。

In ancient *li*, the five [planets] all travelled prograde, it was only in Qin (3rd cent. B.C.) *li* that we first had the retrogradation of [Venus] & [Mars]. Furthermore, though Gan [De] & Shi [Shen] were contemporaries, they had their differences. Only after early Han observations (Sima Qian’s?) was it known that the five [planets] all experience retrogradation. Afterwards, this [knowledge] carried on, but few were capable of investigating the matter further.⁴²

After an extended account of Zhang Zixin’s accomplishments vis-à-vis *li*—

⁴¹ *Han shu*, 26.1290–1291.

⁴² *Sui shu*, 20.561.

accomplishments otherwise covered in Li Chunfeng's *li* monograph in the self-same history—he then concludes on a note similar to Sima Qian's:

後張胄玄、劉孝孫、劉焯等，依此差度，為定入交食分及五星定見定行，與天密會，皆古人所未得也。

Later, Zhang Zhouxuan 張胄玄 (d. c. 613), Liu Xiaosun, Liu Zhuo 劉焯 (A.D. 544–610), et al. went by this equation-degree in [their work on] the fixed (true) crossing-entry eclipse index and five-[planet] fixed appearance & fixed motion, and it tightly accorded with heaven—all things that the ancients did not yet get.⁴³

Li Chunfeng is, by way of our original question, an excellent example of the force, in this author's opinion, behind the change in *tian-wen* omen literature: the growing involvement of *li* experts in its (re)production after the wave of original production began to taper off in the third century A.D. (coinciding, perhaps only by coincidence, by a series of public bans on *tian-wen* from the fourth century A.D. on).⁴⁴ Historical monographs aside, it was in the period after the fall of the Han that we begin to see professionals and renowned *li* experts like Gautama, Li, and Yu Jicai—all of whom, it is worth noting, served as directors of their respective courts' astronomical offices (Prefect Grand Clerk, or PGC)—produce the enormous compendia that would begin to define the field. Very little of the prior literature survives independent of their efforts, but what we can tell from extant bibliographies suggests that this trend was centuries in the making. Sun-Wu 孫吳 (A.D. 220–280) PFG Chen Zhuo 陳卓, for example, compiled a *Heavenly Patterns Collected Omina* (*Tianwen ji zhan* 天文集占 in 10 *j.* and a *Heavenly Offices Star Omina* (*Tianguan xing zhan* 天官星占 in 10 *j.*, while Jin 晉 (A.D. 265–420) PFG Han Yang 韓楊 compiled a *Heavenly Patterns Essential Collection* (*Tianwen yao ji* 天文要集 in 40 *j.*)⁴⁵ The current version of Gautama's *Kaiyuan Omen Classic* comes in at 120 *j.*, and Li Chunfeng's *Yisi zhan* at 10 *j.*; Yu Jicai, in addition to his 115/120-*j.* *Secret Garden of the Observatory*, also compiled a *Monograph on Hanging Signs* (*Chui xiang zhi* 垂象志) in 120/148 *j.*, for example, and celebrated mathematician and *li* man Zu Geng 祖暅, son of Zu Chongzhi 祖沖之 (A.D. 429–500), compiled a *Record of Heavenly Patterns* (*Tianwen lu* 天文錄) in 30 *j.*⁴⁶ To put the scale of these compendia into perspective, the *Book of Sui* bibliographic treatise records 97 works in 675 *j.* in the Sui (A.D. 581–618) imperial holdings; the aforementioned 8 works alone, by contrast, amount to 455/488 *j.*

Men like Li Chunfeng began to take over the field of of *tian-wen* at the top—men at the forefront of *li* who knew better than to treat the planetary

⁴³Ibid.

⁴⁴On the history of these bans, see Susan Whitfield, 'Under the Censor's Eye: Printed Almanacs and Censorship in Ninth-Century China', *British Library Journal* 24, no. 1 (1998): 4–22; Chen Meidong 陳美東, *Zhongguo gudai tianwenxue sixiang* 中國古代天文學思想 (Beijing: Zhongguo kexue jishu chubanshe, 2007), 17–32; Lü Zongli 呂宗力, *Power of the Words: Chen Prophecy in Chinese Politics, AD 265–618* (Oxford: Peter Lang, 2003), 35–81.

⁴⁵*Sui shu*, 34.1018–1019.

⁴⁶Ibid., 20.561, 34.1019, 78.1767.

hemerology of the bygone era as anything other than the well-meaning but mal-informed forerunner of their science.⁴⁷ The result was not singularity *per se*, but the historical circumscription of these curios to a place where they remain to this day. I bring up Li Chunfeng here because his is the most interesting cross section of attitudes towards planetary models, given that what survives of his work covers three different treatments of the topic: in his standard history monograph (finished A.D. 648–656), as previously noted, he introduces early *tian-wen* models with a note of historical explanation; in his Chimera Virtue system (*Linde li* 麟德曆; inst. A.D. 655), he further develops the modern *li* models; and in his practical *tian-wen* compendia of A.D. 656, he provides *li*-styles models as omenological norms. What is particularly interesting, though it brings us beyond the scope of the present article, is that the *li* models included in in *Yisi zhan*—as well as those found in Gautama and Yu Jicai’s compendia—are radically simpler than we would expect from the state of the field in those times.⁴⁸ Sadly, these models are given little explanation, suffer from significant corruption, and have received no scholarly attention to date; were we to pursue the matter further, one imagines, one might find further evidence of plural cultures of practice lurking beneath the surface of ‘the Chinese tradition’.

6 Conclusion

The astral sciences in China have always been part of a larger struggle to impose order upon a world teetering ever on the brink of chaos. The obsession with order lay behind the millennia-long outpour of observations, innovations, and refinements that drove the sciences forward; it lay also, I have attempted to show here, behind successive reimaginings of their past. The case of planetary models is revealing of the sort of ruptures that we might expect to find within the Chinese astral sciences and the discomfort we might expect them to have engendered among historically-minded experts. We began with the *tian-wen/li* framework, ruminating upon our subjects’ division of practices, professions, and textual genres into juxtaposed fields. We saw that models labelled astronomically ‘absurd’ make sense in form and function when considered within the contexts in which we find them, and, emphasizing how the two thrived side-by-side through the centuries, questioned the assumption that the ‘old’ *tian-wen* models evolved into the modern *li* by which they have long been judged. Lastly,

⁴⁷On Li Chunfeng, see Chen Meidong, *Zhongguo kexue jishu shi: tianwenxue juan*, 350–357; Howard L. Goodman, ‘The Life and Intellectual World of Li Chunfeng (602–670)’, in *Monographs in Tang Official Historiography* (forthcoming)

⁴⁸See the references provided in Note 35. Unlike the *li* of its day, for example, the *Secret Garden of the Observatory* appears to use a very small denominator for the fractional parts of different grades’ duration and distance; the numbers, however, are so corrupt that it is difficult to reconstruct. The *Yisi zhan* uses larger denominators befitting contemporary motion-degree models as well as a seasonal algorithm for adjusting the predicted dates of mean visibility phenomena; however, unlike contemporary models, it does not include procedures for calculating respective equations of center. The planetary models of the *Yisi zhan* appear to be completely distinct from those of Li Chunfeng’s Chimera Virtue system (*Linde li* 麟德曆) instituted the year prior to its completion, for which, see *Jiu Tang shu*, 33.1175–1219.

we saw how the tensions between the two seem to have erupted around the sixth century A.D., when a combination of events saw their transition into historical obscurity and eviction from expert/elite *tian-wen* literature in favour of quantitative *li*-based norms of meaningful anomaly. Moving forward, therefore, it is my hope that when we encounter statements about “the Chinese tradition of planetary astronomy” we might rightfully ask “which one?”

This paper began years ago as a study of citation practices, in which I attempted to come to grips with what is (in my opinion) one of the most glaring problems in this period of history: the discrepancy, noted above, between the generally accepted dates of the Three Experts’ star canons (1st cent. B.C. – 3rd cent. A.D.) and planetary models (4th – 3rd cent. B.C.). The additive nature of their respective canons, recognized, for example, by Qian Baocong 錢寶琮 in 1937, goes a long way to accommodate this contradiction.⁴⁹ So too does the clearer understanding we now possess of the manuscript culture within which the astral sciences were practised, developed, transmitted, and consumed at this time. Liu Lexian 劉樂賢, for example, has revealed parallels between the second-century B.C. *Planetary Omina* MS and first-century A.D. (?) weft texts so considerable as to suggest that such literature was not so much *authored* as it was drawn together from a common (and anonymous) pool of omen lore.⁵⁰ If authorship was an idea imposed upon this literature only later in an attempt by technically-minded literati to collect and organize it along familiar lines, this too might explain the hodgepodge of old and new in these works. What I want to point out, however, is that the apparent contradiction—the hodgepodge—is one of our own making based on centuries-old assumptions about the teleological nature of astronomical knowledge. If, instead, we step back and look at the world through the categories by which actors organized their intellectual world prior to Gautama Siddhārtha and Li Chunfeng’s day, we might rediscover the logic of the absurd.

⁴⁹‘Gan-Shi xingjing yuanliu kao’ 甘石星經源流考, in *Qian Baocong kexueshi lunwen xuanji* 錢寶琮科學史論文選集 (1924; rpt. Beijing: Kexue chubanshe, 1983), xx–xx. Note that the *Kaiyuan Omen Classic* is not explicit about its sources for the Three Experts, so it is also possible that the planetary models with which they have been attributed derive separately from, for example, any one of the several works (now lost) attributed to them in later commentary and bibliography.

⁵⁰See his *Jianbo shushu wenxian tanlun* 簡帛數術文獻探論 (Wuhan: Hubei jiaoyu chubanshe, 2002), 341–351; *Mawangdui tianwen shu kaoshi*, 29–99; ‘Weishu zhong de tianwen ziliao—Hetu Dilanxi wei li’ 緯書中的天文資料 —『河圖帝覽嬉』爲例, *Zhongguo shi yanjiu* 中國史研究 2007.2: 71–82. On a similar note concerning the anonymous manuscript transmission of hemerological knowledge over the same period, see Marc Kalinowski, ‘Les livres des jours (*rishu*) des Qin et des Han: la logique éditoriale du recueil A de Shuihudi (217 avant notre ère)’, *T’oung Pao* 94, no. 1 (2008): 1–48; Donald Harper, ‘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*, ed. Robert S. Cohen, Jürgen Renn, and Kostas Gavroglu (Dordrecht: Springer, 2010), 37–80.