

Introduction

There is something special about astronomy. For Mencius (fl. 320 BCE), writing in Confucius' (551–479 BCE) wake, it was the perfect illustration of knowledge done right.

Mencius said, 'All discussion of the nature [of things] in the world-below-heaven comes down to precedence/reason (*gu*), and nothing else. Fundamental to precedent-reasoning (*gu*) is the sharp/smoothness [with which it cuts]. What is detestable about philosophers is their chiselling their way through (to their preferred conclusions). If philosophers could simply act as Yu did in guiding the [flood] waters, then there would be nothing to detest of them: Yu guided the water by simply conducting it where it was wont to go without imposition; if philosophers too could act without imposition, then great indeed would their philosophy be. Whatever the heights of the heavens and the distance of the stars, if one seeks out former instances (*gu*), then one can render the solstices of a thousand years without stirring from one's seat' (*Mencius* IVB.26).¹

Call it *zhi* or *scientia*, the danger of philosophy, one might say, is the way that it devolves into self-referential systems of meaning, its practitioners twining precedence and reason into beguiling yarns when they should be plumbing the order that is. The stakes were high, and no less so for Mencius than for Yu the Great. In Yu's day, humanity clung to high ground, drowned, displaced and ravaged by its rivers, and so too, like the failure of a dyke, did the fall of Zhou in 771 BCE unleash a torrent across the land – a torrent of blood and battle, in the wash of which Mencius mourned as civilisation slipped away. It was by using the nature of water against it that Yu managed to turn the tide, dredging, damming and dyking the river's inexorable course to the sea; and so too, from his *moral* high ground, did Mencius labour to harness the nature of man that it may follow its course to goodness. In the end, the difference between the philosopher and the world-mover, between the crackpot and the prophet, Mencius tells us, is their respective grasp of nature.

Writing a decade after the Great War, amid the rise of the National Socialist movement, the German-born scientist Moritz Schlick could probably sympathise. Prior to his assassination in 1936, Schlick led weekly gatherings at

¹ Tr. modified from Lau (1970, 133) and Pankenier (2013, 420–1).

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the University of Vienna to discuss issues of the philosophy of science. The ‘Vienna circle’, as they were later called, were dedicated in the words of their manifesto to an ‘empiricist and positivist’ world-conception: that ‘there is knowledge only from experience’, and that legitimate science depends upon the ‘application of a certain method, namely logical analysis’.² One of the aims of this ‘logical positivist’ or ‘logical empiricist’ movement was to apply the scientific method to philosophical problems so as to bring matters of truth to resolution and relegate matters of meaning to ‘metaphysics’. An appeal to Enlightenment values, theirs was a losing battle fought against a culture of growing romanticism, mysticism, nationalism and the Hegelian and Heideggerian ‘idealism’ that lent it intellectual force. Little had changed, one might say, between Mencius’ day and Schlick’s, but one detects an echo of Mencian optimism in the latter’s words at Stockton, California, in 1931. Speaking on ‘The Future of Philosophy’, Schlick prophesies how ‘imposition’ will give way to reason, and how the ‘chiselling’ will one day stop:

Of course, the mere fact that thus far the great systems of philosophy have not been successful . . . is no sufficient reason why there should not be some philosophical system discovered in the future that would universally be regarded as the ultimate solution of the great problems. This might indeed be expected to happen if philosophy were a ‘science.’ . . . There is not the slightest doubt that science has advanced and continues to advance, although some people speak skeptically about science. It cannot be seriously doubted for an instant that we know very much more about nature, for example, than people living in former centuries knew (Schlick 1932, 48).

Now, ironically, we do know better. The value for the solar year in Mencius’ time (365¼ days) would, over ‘a thousand years’, produce an error of some eight days and fourteen degrees in right ascension. Schlick’s ‘error’ is less readily quantified. Logical positivism/empiricism quickly found itself embroiled in the problem of confirmation – the inference of generalisations through particular observations – leading to Rudolf Carnap and Karl Popper’s respective retreats to probability and falsification. ‘Science’ proved difficult demarcate, the flood-walls leaving things like unified field theory out, whilst letting chiselling charlatans in.³ The end, however, was spelled by Thomas Kuhn’s 1962 *Structure of Scientific Revolutions* and by the Edinburgh school’s ‘strong programme’ in the sociology of scientific knowledge. Arguing that science functions by long periods of puzzle solving punctuated by crisis-induced gestalt switches, Kuhn turned the ladder of progress into a carousel, turning us in circles, and the magnifying glass into a mirror reflecting our questions back. The strong programme, on the other hand, demanded that ‘good’ science is just as deserving of

² Neurath (1973, 309).

³ For criticism of ‘positivist’ and Popperian philosophies of science, see Putnam (1974), Salmon (1981) and Newton-Smith (1981, 44–76).

explanation as the ‘bad’, focusing on impartiality, symmetry and reflexivity as concerns why scientists and sociologists believe the things they do.⁴ The effect, on both ends, was to desacralise the subject, opening it to sociological analysis and deconstruction like any other element of culture. Shapin and Schaffer (1985) have oriented us towards the objects binding the people and practices into specific scientific cultures; Latour and Woolgar (1986) have invited us into the laboratory to watch these tribes at work; and what has emerged, in the decades since, is something a lot less like Schlick’s ‘ultimate solution’ than a cat’s cradle of objects, agencies and cultures.

History remembers Schlick less kindly than it does Mencius. ‘Confucianism’ is a philosophy; ‘P/positivism’, on the other hand, is now invoked by many as a curse. ‘Positivism’ is the name they give the demon possessing men to write in a celebration of modern powers; ‘positivism’ is the name they bark to command it from its host, but ‘positivism’, let us not forget, was an actual philosophy, and an exigency of other -isms. ‘Naive positivist history of science’ is the spectre that Sivin (2009, 551–7) sees in the ‘pageant of progress’ that modern scholars have made of the history of astronomy. In China, he complains, ‘positivism’ leads to a focus on decontextualised aims ‘that enabled the continuity of China’s brilliant civilization’ and, in Europe, to the presumption that ‘the right aims are those of immaculate European astronomy’, the common thread being that ‘the teleological force of objective modern knowledge, like an immense magnetic field, pulled all the ancient sciences hesitatingly, against the drag of the past, toward that goal’. But is this *positivism*? Kitcher (1993) gives the object of our struggles a different name:

Once, in those dear dead days, almost, but not quite beyond recall, there was a view of science that commanded widespread popular and academic assent. That view deserves a name. I shall call it ‘Legend’.

Legend celebrated science. Depicting the sciences as directed at noble goals, it maintained that those goals have been ever more successfully realized. For explanations of the successes, we need look no further than the exemplary intellectual and moral qualities of the heroes of Legend, the great contributors to the great advances . . .

The noble goals of science have something to do with the attainment of truth . . . According to Legend, science has been very successful in attaining these goals. Successive generations of scientists have filled in more and more parts of the COMPLETE TRUE STORY OF THE WORLD . . . Champions of Legend acknowledged that there have been mistakes and false steps here and there, but they saw an overall trend toward accumulation of truth, or, at the very least, of better and better approximations to truth. Moreover, they offered an explanation both for the occasional mistakes and for the dominant progressive trend: scientists have achieved so much through the use of SCIENTIFIC METHOD (Kitcher 1993, 3, emphasis in original).

⁴ Bloor (1976, 4–5). For a more recent synthesis of the strong programme, see Barnes, Bloor and Henry (1996).

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The goal of this book is to come to terms with ‘Legend’, or something like it, in early imperial China. There too, in the first few centuries of the Common Era, scholars told grandiose stories about the past, present and future of the astral sciences, and we will speak in this book to four of their common themes. Two of these smack of antiquity: the ‘observation of signs’ and ‘granting of seasons’ by hallowed sage kings in ancient scripture. The other two smack of modernity, though they are right there in the ancient past: the legend, for the purposes of the introduction, of ‘empiricism’ and ‘progress’. ‘Science’ is clearly an anachronism when discussing Mencius – which is why I use the term hesitatingly in the plural, denoting ‘technical knowledge’ – but that is no reason, I must insist, to ignore his ‘positivist’ faith in solstice reckoning; it is not, from a modern perspective, the strangest thing that he believed. In fitting with the ‘strong programme’, my approach to such legend will be symmetric, making no distinction between convictions that seem reasonable – reasonable, indeed, for the ancient Chinese mind to have – and those that do not. We will question the reality of these beliefs as social constructs, but what interests us is *how* they were constructed and the realness of their effects upon the practices of their adherents.

What is at stake is precisely ‘the ancient Chinese mind’, because there is, I should like to emphasise, no one such thing. China remains the home, in many quarters, to a timeless and monolithic scientific tradition defined by its ‘practicality’, its ‘official nature’, its deference to authority and its holism. Writing on three neglected divination-board manuals from the eleventh century, Ho Peng Yoke offers a global presentation of ‘Chinese science’ framed in terms of J.G. Frazer’s (1854–1941) laws of sympathetic magic. The divination board, Ho states, ‘introduces [a] dimension of matter without form by referring to something that reminds us of what we now call the sixth sense and telepathy. Hence, what the traditional Chinese person viewed as science embodied the non-materialistic world as well as the tangible’ (Ho Peng Yoke 2003, 9). Frazer, to be clear, identifies sympathetic magic with ‘the savage’, calling it ‘a spurious system of natural law’, ‘a fallacious guide of conduct’, ‘a false science’, and ‘an abortive art’,⁵ but Ho appeals to relativism to turn this into a source of modern pride: ‘The traditional East Asian view was far more universal than Newton’s . . .

⁵ Frazer (1911, vol. 1, 53). Citing ‘J.G. Frazer, the Cambridge anthropologist of *Golden Bough* fame’ (Ho 2003, 8, 23), the essence of Ho Peng Yoke’s (ibid., 8–10) headings ‘What science was to the traditional Chinese’ and ‘A basic difference between East and West’ comes down to this, in the words of Frazer’s first edition: ‘A savage hardly conceives the distinction commonly drawn by more advanced peoples between the natural and the supernatural . . . Side by side with [this view], primitive man has another conception in which we may detect a germ of the modern notion of natural law or the view of nature as a series of events occurring in an invariable order without the intervention of personal agency. The germ of which I speak is involved in that sympathetic magic, as it may be called, which plays a large part in most systems of superstition’ (Frazer 1890, vol. 1, 8–9).

Today some people advocate “fuzzy logic” and the “chaos theory” as a departure from the rigid Greek rationalism. Perhaps this is a step forward in the direction of the East Asian tradition’ (*ibid.*, 10). We have stopped asking why ‘the Chinese’ did not develop (the real) science (of ‘the Europeans’),⁶ but whatever our justification for reducing our subject’s mental world to a singular metaphysics of correlation – for stopping at Frazer’s ‘Practical Magic’ – it leaves them in a dragon-haunted world absent the possibility of distinction or disenchantment. It leaves ‘the Chinese’, via post-modern sleight of hand, the self-same ‘savage’ invented by the nineteenth-century anthropologist.⁷

The problem is that our sources are actually quite explicit about distinctions and disenchantments, and ‘Chinese science’ gets in the way of us seeing that. It is to this end that we will focus on the astral sciences, and not just because there are more than one. The astral sciences (*tianwen* and *li*) span a fertile range of cultural activities – data collection, theorizing, testing, time control, politics and ritual – they combine what is often presumed to be the most abstract and universal of sciences – mathematics – with practical and philosophical questions like observation, proof and instrument building; furthermore, they connect the world of rarefied intellectual pursuits with that of the clock-punching, omen-fearing Everyman. Heaven is vast, and it was experienced in different ways. Legend is to blame for reducing this variety into unity; my goal, however, is not to overthrow legends, as such, but to return us to those through which our subjects saw the world. What this means is that we need to redraw distinctions of terminology, genres, institutions and exemplars as appropriate to our subjects’ usages – the sort of existential boundaries that they argued with the intensity with which we now do ‘science’ and ‘religion’. What it also means is recognising how disagreement shaped and reshaped those distinctions – disagreement between voices, disagreement between centuries, and disagreement, most importantly, between philosophical ideals and everyday practice. ‘Legend’, I would like to show, provides a solution to disagreement by furnishing it a venue.

As to methodology, I intended for the present work to be theoretical and comparative and, conversely, for theory and comparison not to stand in the way of primary sources. To me, the best way that I can think of to apply recent insights in the history and philosophy of science to my sources is as an aide to *forgetting*, the cornerstone of our trade. Forgetting is essential to the historian

⁶ For the closing of the ‘why not’ question, see Sivin (1982), Hart (1999) and Kim (2004).

⁷ Now referred to as ‘Chinese cosmology’, Henderson (1984) provides an excellent introduction to the topic of correlative thinking in China, and the modern anthropological and sinological approach thereto, as well as how such thinking came under criticism and, ultimately, scepticism over the course of Chinese history. Harper (1998, 10–11; 1999) likewise reminds us of the limited and piecemeal nature of five-agents correlative metaphysics within early ‘numbers and procedures’ technical knowledge. On the perseverance of nineteenth- and early twentieth-century theories of the ‘primitive’ in Chinese studies, see Brown (2006).

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of the ancient world, because it is only when we let go of modern assumptions about ethics, power, gender, reason and daily tasks that the grunt work of textual and terrestrial archaeology can reveal something of the other beyond the self. I would not want to read Daston and Galison's (2007) conclusions about modern scientific atlases onto premodern omen compendia, for example, but what they tell us to forget about a trans-historical conception of 'objectivity' is as priceless as what we must forget about writing in the age before print. My attempts to reconstruct a coherent discourse from original objects and authors' words often lead in odd directions, and where I feel myself lost is where I turn to comparison. The question for me is not how China and Greece were *different* – a question better entrusted to G.E.R. Lloyd (2006; 2007; 1996) – but whether I can find where Ptolemy, Āryabhaṭīya or a cuneiform tablet might say the same thing in different words. Where they do, I readjust my sinologist's assumptions about what is plausible. Where they do, moreover, the scholars in these respective fields often pose questions that I, as a sinologist, have never thought to ask. At the end of the day, however, I prefer to quote a historian of the seventh century over one of the twenty-first, and to highlight parallels within my subjects' cultures over those without. This is a history of China, so 'China for essence, West for use'.

As to presentation, we begin in Chapter 1 by setting the conceptual, historical and sociological stage for the rest of the book. We begin with an analysis of what the actors' categories *tianwen* and *li* entail as words, practices, textual genres and knowledge of legendarily divine origin, asking, at every step, why actors thought to juxtapose the two. From there, I offer a historical overview of the one – *li* mathematical astronomy – over the course of the Han (206 BCE–220 CE), recounting the same history twice so that we may separate public policy from private practice. We move from there to an overview of the cast of characters and the values, motivations, education, career paths and epistemic contentions at play in that history. With an idea of the players, playing field and rules, we will proceed from there to take up each of the legends holding this world together.

In the following two chapters, we will take an object-oriented approach to the founding legend of *tianwen* and *li* – that the sage kings at the beginning of time realised paradise on earth by 'observing the signs' and 'granting the seasons', and that paradise lost may be regained by much the same. In Chapter 2, we take up 'observing' as mediated by the material instruments through which our early imperial subjects saw. Establishing what was available to whom, when and what they thought to do with it, we shall ask why experts for so many centuries waxed ecstatic on the armillary sphere – an instrument whose history was one of want, waste, confusion, foreign production and approximation. The answer, I offer, is that the philosophical potential of the sphere loomed larger than its material reality in the literati's mind, for which 'observation' (*guan*) was something different than it is today. In Chapter 3, we

then take up the question of ‘granting the seasons’ as mediated by the material instruments of time control – calendars. Using calendars excavated from contemporary tombs and administrative dumps, we will examine the sort of material practicalities that went into the production, distribution and use of calendars in a manuscript culture. Juxtaposing how things *worked* with how things *ought to have worked* according to the classicist’s ideology of time control and the astronomer’s ideology of accuracy, we will identify contradictions in theory and administrative practice and explore how those contradictions were negotiated. In both cases, we find that what it means to ‘observe the signs’ and ‘grant the seasons’ changes over centuries of debate.

In the following chapters, we then turn to the legend of ‘empiricism’ and ‘progress’, which I will swap for actors’ categories, substantiate with thick description, critically evaluate, and attempt to ground in cultural phenomena external to the astral sciences. In Chapter 4, we will take up the question of ‘tightness’ and how it is ‘verified’ via live trial and public debate in the context of calendro-astronomical policy reform. Making a case study of a failed reform at the Cao Wei (220–65 CE) court, I lay out the context of the debate in court and interpersonal politics and offer an analysis of the rhetoric and data mounted by each side of the aisle. The numbers, in this case, speak louder than the words, but the numbers, I argue, are arrived at by something of a game. In Chapter 5, we then turn to the theme of ‘accumulation’ as the historical trajectory of the astral sciences. Regardless of whether there *is* progress, we will examine how actors recount the history of the field to their own day, spotlighting the passing comments of the practitioner and the fastidious narrative of the historian. ‘Accumulation’ is so recurrent a theme in the astral sciences, I attempt to show, that it proves a point of contention as to *how*, and not *if*, human knowledge advances, the question being one that we can likewise trace through participants’ writings on religious salvation.

In Chapter 6, finally, we will turn to comparison, using the struggle between mathematics and divinity as it is negotiated in early imperial historiography as a lens through which to consider how Greek, Mesopotamian, Indian and European writers thought to construct their respective histories of science and civilisation. Faced with a common dilemma – how to reconcile the infallibility of ancient gods with the advancement of human knowledge – I will attempt to argue that the place for the East in the Western past is a product of the same forces that turned the Chinese mathematician against his gods.

Conventions

Before we begin, I owe the reader an explanation of my conventions. As concerns the Chinese language, I shall be using the modern, international academic standard of Hanyu Pinyin for romanisation, which, for the non-sinologist,

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is different from the Wade–Giles (Nathan Sivin) and Needham systems. The Pinyin and Chinese characters for people, e.g. Li Chunfeng 李淳風 (602–70 CE), and works, e.g. the Quarter-remainder *li* (*Sifen li* 四分曆) (85/86 CE), are supplied in the Index. In translation, I shall stick as closely to the original language of my sources as possible, preferring to translate *chi-ji* 遲疾 ‘slow–fast’ rather than ‘equation of centre’, for example, so as to avoid that we think about such things in Ptolemaic terms. As to dates, note that I shall render dates in Y-M-D format, giving ‘Martial Establishment 19-IV²-5, *wuzi*.₂₅’ instead of ‘Martial Establishment era, year nineteen, intercalary month four, day five, day *wuzi* (25) in the sexagenary cycle’ (1 June 43 CE). I translate official and noble titles as per Hucker (1985) with slight modifications for astronomical offices. As to co-ordinates in the sexagenary cycle (e.g. *wuzi*.₂₅), heavenly stems (e.g. *wu*._{S05}), earthly branches (e.g. *zi*._{B01}), twenty-eight lodges (e.g. *Wings*._{L27}), and twenty-four *qi* (e.g. spring equinox._{Q04}), diagrams await you in the Appendix.

1 The World Below

The science of heaven is conducted here, in the world below, so it is here that we must set our stage. If the stage takes several pages to set, it is because the story that we are about to hear is not that of *astronomy* but of her cousin thrice removed and otherwise conceived. ‘Astronomy’, one might say, is the modern study of space and/as time; it is *exact knowledge* grounded in methodology, precision instruments and institutions, the purpose of which is to resolve questions about the origins and workings of our world otherwise left to charlatans and speculation. That too is what the ancients said about what they were doing. The questions, methods and tools were different, of course, but so too were the charlatans. There are *always* charlatans, even in fables, and this is as much their story as anyone else’s, for though it may not have been ‘science’, ‘peer review’ or ‘superstition’, rest assured that the ‘expert’ defined himself with labels meant to set the two apart. There were fables too, for that matter, as it is by storytelling that man substantiates the labels defining his community; where we might invoke a Copernicus (1473–1543), however, our subjects might reach instead for Liu Hong (fl. 167–206 CE), there being heroes elsewhere and prior to our own.

If we want to understand what our subjects are doing we must start from what they *think* they are doing. With what field do they identify a given practice? How do they define that field in relation to others? Whence did it arise, and to what end? To what examples did they aspire? What terms do they actually use, and what do these terms imply in context? Early imperial China presents us with a world of distinctions every bit as complex and contentious as our own, and since we cannot rely upon ours alone to navigate that world, we therefore begin in Section 1.1 with an outline of textual genres, actors’ categories and legend intended to reveal the conceptual frameworks at play.

The history of the astral sciences in China begins in earnest at the inception of empire, in the third century BCE. It is from this point on, that is to say, that the textual record begins and the subject is picked up in the ‘monographs’ (*zhi*) of the ‘standard histories’ (*zheng shi*). It is from this point on, moreover, that the narrative transitions from sage kings and culture heroes to the sort of men and women who leave us with biographies, authored works and records of their

careers. In Section 1.2, we move to the Qin (221–207 BCE) and Han (206 BCE–220 CE) and into the history, properly speaking, of astronomy and calendrics. The history of this period is one that is often told through a sequence of government reforms – a frame that supports an impression of contiguity, practicality and bureaucratic restraint. As a corrective, I shall tell this history twice, once from the perspective of policy, and once again from that of practice. The goal of this exercise, beyond familiarising the reader with the subject, is to disentangle these historical threads and to provide a framework by which to consider the dynamics between them.

Whether our focus is practice or policy, the history of the astral sciences remains foremost a history of *people*, which brings us finally to the cast of characters. The state, we know, involved itself in astronomy for reasons of ideology and legitimation, but what about the individual? What was his motivation? How did he come to learn and practise *li*? How was he employed, and in what relation did he stand to the state astronomical office? What methods and values, finally, do we see each party express, and how were these negotiated? To address these questions, Section 1.3 offers an overview of the sociology of knowledge and practice in the Qin and Han, covering matters of institutions, individuals, education, employment, methodology, motivations, rhetoric and epistemology. The point here, needless to say, is to reveal (and revel in) the diversity of this community rather than distil a single archetype from its members.

1.1 Intellectual Framework

1.1.1 Genre

Throughout this book, I shall borrow the term ‘astral sciences’ from Assyriology to refer collectively to what our historical subjects call *tianwen* and *li*. Practices handily identifiable as such are central to the earliest myths and written records in China, but we shall be focusing in this book on the period in which *tianwen* and *li* are well in place as self-identified fields of scholastic discourse.¹ There were *two* astral sciences, so if we are to understand either, in itself, we must begin at the line that our subjects thought to draw between them. Where such distinctions are considered, sinologists tend to trace that line along one of three divides:²

¹ On pre-imperial practices pertaining to *tianwen* and *li*, see Keightley (2000, 17–53), Smith (2011) and Pankenier (2013).

² The position that ① *tianwen* and *li* are complementary aspects of a single ‘astronomy’ is implicit in the way in which most studies deploy primary sources; for an explicit statement, see Zhang Wenyu (2008, 5–7). For the position that ② *tianwen* and *li* are sciences of divination and

- ① *tianwen* : observation :: *li* : computation
- ② *tianwen* : qualitative : ‘astrology’ :: *li* : quantitative : ‘astronomy’
- ③ *tianwen* : space : ‘astronomy’ :: *li* : time : ‘calendrics’

The disconnect of these options hints at the difficulty of rendering *tianwen* and *li* into modern terms. Is *li* ‘astronomy’, or is *tianwen*? And how could either function independent of space or time? For now, let us stick to premodern terms and appeal to ancient parallels.

Most of *tianwen* and *li* comes down to us through the eponymous ‘monographs’ of the standard histories, of which we possess thirty in 131 fascicles spanning 2,116 years. What compilers thought to put in these monographs tells us something about the scope, organisation and evolution of these categories in their day. The ‘Tianwen zhi’ inevitably comprises one to three sections. At its core is an annals of observed phenomena, the focus of which is the *zhan* (‘reading’) and *yan* (‘verification’) of omens relating to national security – what the Assyriologist might label an ‘astronomical diary’.³ The annals are usually accompanied by a catalogue of heavenly bodies and anomalies listing physical descriptions, cultural associations, and ‘when/if’–‘then’ *zhan* formulae – what the Assyriologist would place with *Enūma Anu Enlil* under ‘astral omen literature’. Starting in the fifth century CE, some *tianwen* monographs also open with a history of instrumentation (e.g. armillary spheres) and cosmology (i.e. the shape and workings of ‘heaven’).⁴ Turning to *li*, one notes that *li* often features in a joint monograph with *lü* (‘pitch-pipes’, ‘tono-metrics’ or ‘standards’); be it a ‘Li zhi’ or a ‘Lü-li zhi’, however, *lü* and *li* are segregated such that we may speak of *li* separately. Organised chronologically (rather than topically), the *li* monograph (or monograph section) chronicles noteworthy events up to the end of the dynasty in question in the history of what the Assyriologist would call ‘mathematical astronomy’ and ‘the civil calendar’.⁵

mathematics, respectively, looking incommensurately at the same sky, see Chen Zungui (2006, 1002), Nakayama (1965; 1966), Jiang Xiaoyuan (1991, esp. 1–6, 109–15) and Chen Meidong (2007, 1–16). For the position that ③ the one deals exclusively with space and the other with time, see Needham (1959, 390–408), Nakayama (1965), Kalinowski (1996, 71–2) and Henderson (2006, 97). For an attempt to go beyond these definitions, see Lloyd (2008).

³ I prefer to render *zhan* as ‘omen-reading’ rather than ‘prognostication’, because, as modern and pre-modern scholarship alike affirm, *zhan* are just as often diagnostic as they are prognostic; see for example Chen Meidong (2007, 696–702) and *Yisi zhan*, 1.2a–3a.

⁴ On the ‘Tianwen zhi’ genre, see the translation of the *Book of Jin* monograph in Ho (1966) and the author’s forthcoming chapter, ‘Heavenly patterns’, in Chaussende, Morgan and Chemla (forthcoming). Note that I use the observer’s category ‘cosmology’ as a stand-in for the actor’s category *tian ti* (‘heaven’s form’) and ‘metaphysics’ for *yin-yang wuxing* (‘yin-yang and five agents’ correlative thought) following the distinction made by Sivin (1969, esp. 9 n2), Cullen (1996, xi n2), Kawahara (1996, esp. 3, 288) and pre-1980s sinological usages.

⁵ On the ‘Lü-li zhi’ genre, see the author’s forthcoming chapter with Howard L. Goodman in Chaussende, Morgan & Chemla (forthcoming). On the early *lü-li* synthesis, see Kawahara (1991) and Vogel (1994).

Bibliographic monographs from the self-same standard histories shed further light on these categories. The earliest such monograph, the *Book of Han* ‘Yi wen zhi’ (92 CE), places *tianwen* and *li* as the first of six subcategories of ‘Numbers and Procedures’ (*shu shu*):⁶

1. ‘*Tianwen*’
2. ‘*Li* and Genealogies’ (*li pu*)
3. ‘Five Agents [Hemerology]’ (*wu xing*)
4. ‘Milfoil and Tortoise[-shell Divination]’ (*shi gui*)
5. ‘Miscellaneous [Terrestrial] Omen-Reading’ (*za zhan*)
6. ‘Morphomancy’ (*xingfa*)

All but one of the 190 works that the *Book of Han* lists under ‘Numbers and Procedures’ are now lost, but their *titles* nonetheless reveal something about their contents. The ‘*Tianwen*’ titles fall into two groups: *zhan* omen series and *zhan-yan* verificatory records. The ‘*Li* and Genealogies’ titles fall into four: *li*, gnomonics (*rigui*), genealogies (*pu*) and mathematics (*suan*). This was not the last word of bibliographic classification. By the time of the *Book of Sui* (656 CE), bibliographers had rolled headings 4–6 into ‘Five Agents’ and moved 1–3 under ‘Masters’ (*zi*), alongside philosophy, agriculture, warfare and medicine. ‘*Tianwen*’ and ‘*Li* and Genealogies’ (now ‘*Li* and Numbers’) remained basically unchanged except for their absorption of new genres: under ‘*Tianwen*’ appear titles on cosmology, armillary spheres and ‘Brahman’ *tianwen*; under ‘*Li* and Numbers’ appear ‘Brahman’ *li* and mathematics, as well as archaeo-astronomical studies of ancient methods and records. Later bibliographies expand upon the *Book of Sui* framework.⁷

It is interesting to note what sky- and time-related knowledge bibliographers *exclude* from *tianwen* and *li*. First, one finds ritual and festival calendars (e.g. the ‘monthly ordinance’ genre of *parapegmata*) under the ‘Ritual’ (*li*) subheading of ‘Classics’ (*jing*). Second, hemerology (calendar divination) is consistently placed under ‘Five Agents’. Third, techniques for absorbing celestial *qi* and travelling to the stars are found alongside works on bodily cultivation and alchemy under ‘Recipes and Skills’ (*fang ji*).⁸ When it came to organising the imperial library, these were different things, and they were shelved accordingly.⁹

⁶ *HS* 30.1763–75. ⁷ *Sui shu*, 34.1018–26; *JTS* 47.2036–9; *XTS* 59.1543–9.

⁸ On calendar divination and ritual, see Chapter 3 below. On magico-religious practices involving space and time travel, see Schafer (1977, 234–69), Schipper & Wang (1986), Andersen (1990) and Raz (2005).

⁹ On the bibliographic monographs and early imperial libraries, see Drège (1991). Over the last two decades, the *Book of Han* category ‘Shu shu’ (Numbers and Procedures) has emerged as a cause célèbre among scholars of excavated divination literature as suggestive of the parity (if not indistinction) of the mathematical and divinatory sciences; see Li Ling (2006, 1–24), Song Huiqun (1999), Liu Lexian (2002, 3–52) and Kalinowski (2004). For a word of caution about over-reading and over-extending this actor’s category, see Harper (1999) and Xia De’an (2007). On *shu shu* from the perspective of the history of astronomy, see Jiang Xiaoyuan (1991, 47–55) and Kawahara (1996, 54–79).