

## CHAPTER TWENTY-ONE

# Science, Technology, and Medicine

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### A Portrait of the Discipline as a Young Field

First translated into Chinese in 1975, James Joyce's *A Portrait of the Artist as a Young Man* presented readers with an early page that situated the young hero of the story within increasingly expansive localities that collectively shaped his identity:

Stephen Dedalus  
Class of Elements  
Clongowes Wood College  
Sallins  
County Kildare  
Ireland  
Europe  
The World  
The Universe

In Joyce's hands, Stephen Dedalus was a figure who, in name and journey, evoked the classic Greek tale of Daedalus and Icarus, the father and son whose fate epitomized the dangers of ambition and—in a way—the risks accompanying innovation in the history of technology. Framed with an epigram from Ovid,<sup>1</sup> a writer who might be considered a kind of poet laureate of metamorphosis, Joyce's story recounted the journey of Dedalus as he grew into a man, into the future, and into the unknown.

When translators Li Wenbin and Li Dengxin translated Joyce's story into Chinese in 1975 as *Yi wei nianqing yishujia de huaxiang* (Li and Li 1975), they rendered not just a coming-of-age story about the growth of a boy into a man, or the world that Dedalus mapped on the flyleaf of his school geography book, but also the categories that mapped the identity of a youth coming into his own as a self-conscious and self-reflexive individual.

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These categories began at the level of the self and zoomed outward into increasingly encompassing communities: class, school, town, county, nation, planet, universe. This attention to the scales and localities that create individual identity is also a productive way to map the history of science, technology, and medicine as they have come to be characterized in the field of Chinese history, and the growth of their collective study as a coherent field of inquiry. Contemporary scholarship on the history of science in China has changed how we understand and articulate the scales of production and practices of knowledge of the natural world. Tracing the relationships produced at the level of some of the scales that have proven especially significant in characterizing and transforming the history of science in China—field, period, body, nation-state, empire—is one way to appreciate the past and possible futures of this exciting area of scholarly inquiry. It is also a way to appreciate how the documentary archive of the history of science and the stories emerging from it have been variously translated by scholars of Chinese history.

### The field

There was a time when it was possible to think about the history of science, technology, and medicine in China as if that field named a coherent, easily identifiable thing. We thought we knew what “Chinese science” was: it was something that created a written archive—or was equivalent to that archive itself—in the Chinese language. (Indeed, we imagined, at least insofar as the assumption helped define the nature of our practice, what texts we counted as relevant and how we looked for and read them, that there was something like a singular “Chinese language.”) It had occurred and was possibly still occurring within a location roughly coextensive with today’s People’s Republic of China. It constituted part of a larger entity we might refer to as “Chinese thought” or “Chinese culture.” It was undertaken by people we would identify as “Chinese.” And it was roughly comparable with (and in fact was defined in terms of its comparability to) the history of science in western Europe and the anglophone world (or, “the west”). In the last decade, all of these assumptions have been challenged, and the result has been an increasingly lively body of work that has begun transforming not only how we understand the histories of science, technology, and medicine in China, but also how we conceptualize these practices in broader global terms. In the rest of this chapter I introduce some of the major questions and problems animating the field, highlight some of the most promising ways that those questions have been explored and attended to, and suggest some of the concepts and products we may look forward to in the future.

In order to do that, we first need to understand what is meant by “the field.”<sup>2</sup> One challenge of conceptualizing the triad “science, technology, and medicine” is the lack of consensus on whether they collectively constitute a single area of disciplinary inquiry, or instead name three related but distinct and separate fields of study.<sup>3</sup> Historians of science and technology in China write from disparate disciplinary homes that include departments of history, science studies, area studies, and history and philosophy of science, among others. Some are based in university settings, some are writing from research institutes, and some are independent scholars, a distinction that is important, in part, insofar as the institutional context in which a scholar works often importantly shapes the nature of her scholarly contributions to a field. Historians of medicine write from all of these contexts, as well as anthropology and sociology departments, medical schools, and offices of clinical practice. From these different intellectual habitats emerge varying ways of manipulating some of the basic tools of the historian’s craft: evidence, narrative,

archive. This multiplicity has helped generate a tremendously interdisciplinary and polyvocal literature that tends to cohere, when it does do so, around key documents, interlocutors, and historiographical questions. For our purposes, those three components act as a kind of glue that holds the works under consideration here together in something that we might identify as a field.

The archive of documents comprising the raw material of the historian of science, technology, and medicine in China has transformed in recent years. What used to constitute the body of materials considered relevant to the task included texts that looked something like, or were otherwise directly comparable to, the texts constituting the scholarly archive of the history of science in the European context—alchemical treatises, canonical texts on medical theory and pharmaceutical practice, work on the invention and use of technologies like clocks and astrolabes, among others. As the historiography has turned to encompass a broader range of the social, cultural, and epistemological history of knowledge-making in China, the documentary archive has broadened to include the kinds of texts that situate science, technology, and medicine within a wider range of human practices. As more scholars have incorporated attention to non-elite actors in shaping this history, the archive has further expanded to include documents produced in household spaces and traces citizen participation in science. And as we break down the boundaries that had previously been accepted as separating spheres of human activity like religion and medicine, popular fiction and technology, language learning and science, that archive has grown in increasingly interesting ways.

This growth has brought challenges to the field in addition to the opportunities described above. As the documentary archive expands and transforms scholarly notions of what is relevant to the study of science, medicine, and technology in China, there are increasingly many ways of identifying practices and literatures that constitute part of the genealogy of “science,” “medicine,” and “technology.” This is true across the temporal span of the field—and it is not a problem or opportunity that is local only to scholarship on China—but it has been especially vexing or interesting (depending on one’s perspective) in the case of scholarship on premodern science. The broadening archive has helped spur a diversity of ways of thinking about and producing the kind of work that might fall under the rubric of the history of science, and as a result it is not necessarily clear which disciplinary organs (including journals and societies), academic jobs, or institutional frames for work in the field of the history of science scholars of premodern China may find a home in. In general this has been embraced as an opportunity rather than an impediment to scholarship, and it has produced an increasingly expansive bent that has moved work in the history of science in China beyond a strictly disciplinary frame. Indeed, the study of science, technology, and medicine in China’s history has become a deeply transdisciplinary and translocal endeavor. It is transdisciplinary insofar as the disciplinary and departmental homes of historians who self-identify as working in this field span the arts, humanities, and sciences. It is translocal in that these historians (even if we limit ourselves to historians working at least in part in written and spoken English) are spread across the globe in a wide variety of institutions and spaces. For both sets of reasons, the kinds of questions and modes of enacting the historian’s craft—including identifying relevant interlocutors—can vary dramatically. Sometimes that historiographical variance is a matter of the institutional or geographical home of the historian. Sometimes it is based in the primary discipline in which a historian has been trained, has chosen to work within, and/or prefers to speak to (Nappi 2013). In any case, this plurality of methodologies and approaches has both enriched the study of science,

medicine, and technology in China and offered challenges for those readers interested in gaining an encompassing view of the major trends and threads of discourse within this plural ecology.

Recent work that traverses this terrain tends to be animated by one or more key questions, and it is the nature of those questions, more than anything else, that draws historians of science, technology, and medicine in China together as a field. Early work on the history of science in China grew out of an explicit conversation with the historiography of European science, and its major approaches to scholarly inquiry were shaped accordingly. The work of Joseph Needham pioneered a field that constellated around questions that took the explicit form of comparisons with “Western” science and the historical study thereof (Needham 1954–2004; Needham and Yates 1994; Brook 1996; Multhauf 1996; Needham and Lu 2000). Some explicitly approached the study of China as a study of lack or absence: Why did the Scientific Revolution not take place in China (Sivin 1982)? Why did modern science not develop in China (Huff 2011)? Some of the historiography of science is still animated by questions that grow out of this early literature but locate it with respect to (and in conversation with) different fields of inquiry: Can we identify features of the ecology, economy, and/or political structures of historical China that contributed to a “Great Divergence” that set it on a path markedly different from that of Western Europe (Pomeranz 2000)? In what ways have phenomena or conditions on a global scale constrained the possibilities of scientific development in China? These sorts of questions, often at least implicitly defined by an implied counterfactual that asks why something did *not* happen and posits what might have occurred if it had, tied together a generation of historiography on Chinese science.

The generation that followed was largely (though not entirely) devoted to undermining a previous tendency to write the historiography of science in China as a story of absence, failure, or lack. Some scholars accomplished this by abstracting general characteristics of a “Chinese science” or “Chinese medicine” out of careful textual work and by placing the resulting history of a Chinese scientific or medical culture into dialogue with that of other scientific cultures (Kuriyama 1999; Lloyd and Sivin 2002). This explicitly comparative work transformed a narrative of lack into one instead of difference and divergence. Other scholars turned toward a finer-grained analysis of the technologies of knowledge-making in premodern China (Bray 1997; Nappi 2009; Schäfer 2011). Those technologies included language and translation, and an important body of work looked explicitly at the ways that the translation of science and medicine shaped the terms of conversation in China since at least the sixteenth century, most often conceived as a process of rendering terms, ideas, and texts from European languages and English into Chinese and sometimes paying careful attention to the agency of the Japanese language as a mediator of that process (Liu 1995; Hart 2000; Wright 2000; Lackner, Amelung, and Kurtz 2001; Elman 2005). Some of these scholars took on the task of illuminating that history of science and its translations within China by approaching the history of scientific and medical practitioners “on their own terms,” in the words of one scholar, paying careful attention to how translated knowledge practices were naturalized and embedded within the larger frame of an explicitly “Chinese” history of texts and ideas (Elman 2005). Thus historians of science have studied the transformations of knowledge cultures in situ as they have moved from philosophy to philology (Elman 2001), from dynasty to dynasty (Unschuld 1985), from text to experience (Sivin 1995), and from something we might call “tradition” to something we might call “modernity” (Sivin 1987; Hsu 2001; Scheid 2002). Landmark studies in the history of Chinese medicine

charted transformations in the institutional, political, and cultural contexts of illness and healing across dynasties.

The questions animating contemporary work in the field tend to move even further from the roots of the field as described above. Recent authors have begun moving away from questions about “Chinese science” and toward questions about science in China, understanding “China” to mean very different things in different historical and local contexts and integrating an attention to that plurality into the fabric of their studies. Locating ourselves in some of those contexts can help us understand where the field is now and where it may be going.

### The period

If the field is one locality in which to situate an understanding of the nature and growth of the history of science in China, the temporal period is another. The kinds of documents produced and preserved in the context of scientific, technological, and medical practices in Chinese history have been substantially different in different times, and often the most provocative and illuminating recent work acknowledges the materiality and situatedness of its documentary archive.

Scholars working on early China have been particularly concerned with the opportunities and challenges posed by excavated texts—which often survive in fragments of partial legibility—and have benefited from close engagement with the work of archaeologists. Studies of healing and medicine in early China have highlighted the diversity of kinds of sources that constitute the archive of early healing, which included divination, classical studies, and various forms of ritual practice (Harper 1998). Excavation of the Mawangdui site has proven especially important to understanding not only early medical texts, but also early foodways. Indeed, the study of early work on food and eating in China has been a fruitful field for historians of science and medicine, who have considered the intertwined histories of *materia medica*, dietetics, ritual, and eating (Sterckx 2005). Scholars taking a fresh look at received texts alongside excavated documents have shown that early Chinese work on human bodies brought together what may today be considered disparate areas into a common conversation, including music, medicine, politics, and cosmology (Brindley 2012). This work—alongside scholarship on planetary, mathematical, and other types of bodies—has been useful in showing how early Chinese texts can help challenge the notion that early fields of inquiry mapped unproblematically onto modern fields or disciplines: individual texts often describe practices that straddle what may be described today as mathematics, astronomy, health, and agriculture. Scholars of early China have also reminded us that it is sometimes not at all clear how to identify and define a stable text and associate it with an author or authors (Cullen 1996).

The historiography of the science, medicine, and technology of earliest China has not tended to problematize the name of the temporal scale under inquiry: referring to the relevant period as “early” or “ancient” is fairly unproblematic. As we move later into the history of China, however, scholars tend increasingly to diverge in their approaches to carving Chinese history into distinct periods, and in articulating what the implications of those decisions are for how historians tell their stories. Scholarship on what is sometimes termed a “medieval” period of Chinese history is a case in point. Historical work on manuscripts collected in Dunhuang epitomizes an approach to “medieval” science, medicine, and technology that tends toward narratives of cosmopolitanism or cross-cultural exchange in China. Benefiting from archaeological excavations in shaping their material

documentary archive, and paying special attention to the materiality of that archive in terms of inclusion of documents written on bamboo and wood, these scholars have offered a fascinating glimpse of the range of practices available in the medical marketplace of the medieval silk routes, spanning divinatory arts, pharmacology, love charms, moxibustion, and various forms of self-cultivation (Lo and Cullen 2005). The description of these practices and documents as explicitly “medieval” tends to integrate the resulting analyses within a larger history of a medieval globe shaped by the circulations and itineraries of objects, people, and ideas: in this way, the periodization of this period of the history of science tends to direct particular ways of reading and working with the documentary archive, and of asking questions of it.

Other scholars have tended to embrace a mode of reading and analyzing their documentary archive in terms that lead away from a more globally situated story and instead toward a story that is firmly grounded in the unit of the dynasty. In contrast to the medieval example described above, a more dynastically focused approach to understanding the science, technology, and medicine of “Song” China (a period that may alternately be incorporated into a “medieval” story along the lines described above) has yielded work more centrally concerned with the specific kinds of intellectual, political, and social phenomena germane to a specific period of imperial rule. Taking a dynastic perspective, for example, helps to illuminate the importance of print culture and imperial patronage in driving the history of science, medicine, or technology (Goldschmidt 2009), and to analyze the kinds of changes in scientific and medical personae that have accompanied dynastic change (Hymes 1987). This approach to understanding the history of science in China has tended to locate its questions and analyses within the spaces of dynastic rule, and in relation to the imperial court.

Historians of the science, technology, and medicine of the period extending roughly from the fourteenth through the eighteenth centuries in China have shown a particularly marked diversity in their approaches to periodizing their work. A voluminous literature chronicles ongoing debates over how to describe this era of Chinese history. Is it late imperial? Early modern? Ming/Qing? What if the Qing is not properly considered “Chinese” history at all? How should a consideration of these issues be informed by how we understand the Qing, or the Ming, in the context of global empire? Though these debates have not yet explicitly shaped discussions by historians of science, technology, and medicine, the interested reader can find traces of them in the character of the narratives that have recently emerged about this stretch of China’s past.

For as long as the Ming and Qing dynasties have featured in the historiography of science, they have collectively been understood according to the rubric of late imperial history. Recalling the dynastic approach described above in the case of Song science, one central concern of scholars who have situated the production of science and knowledge in Ming and Qing China within an explicitly imperial frame has been the relationship between knowledge practices and the particular locality of the court. Recalling an important body of recent work by scholars of early modern history (Raj 2007; Subrahmanyam 2012), some of these scholars have focused on the importance of court patronage in producing a space in which the practices of sciences were embedded within a broader context of political interests and relationships. Prominently featured in this historiography is a concern with translation and translators in moving texts, terms, and ideas into and out of Chinese- (and, to a lesser extent, Manchu-) language contexts in late imperial China. This has been particularly salient in work on the reign of the Kangxi emperor, whose relationships with Jesuit scholars generated a fascinating documentary archive in languages

that include Latin, French, Chinese, and Manchu (Jami, Engelfriet, and Blue 2001; Elman 2005; Hsia 2009; Hart 2011; 2013; Jami 2012). Science and technology at the Qianlong court—understood especially in the context of the emperor as central figure motivating and supporting the making of knowledge and its traces—has also become an important topic of interest for historians of the eighteenth century (Kleutghen 2015).

An increasing number of Ming and Qing historians are writing histories that move away from a late imperial periodization and instead situate science, technology, and medicine from the fourteenth or fifteenth century through the eighteenth century in an early modern frame (Hostetler 2001; Nappi 2009; Schäfer 2011). This approach can take a number of forms and is motivated by different aims and agendas: some historians are aiming to integrate Chinese science within a comprehensive story of global changes in economy, politics, and knowledge, while others are simply interested in using the concept of early modernity as an instrument to create a conversation with non-China specialists without taking on a broader global history agenda. In either case, the resulting literature has enmeshed the study of China more firmly within a multi-sited history of knowledge, materials, practices, and their circulations in the premodern world. As they are explicitly engaging with problems and concepts that tend to be rooted in the historical literature on early modern Europe and the Americas, these studies tend to echo and speak to the historiographical language of that literature, whether it is by exploring the significance of cartography and ethnography to the making of empire (Hostetler 2001), studying exotica and marvels in early modern Chinese discourse (Zhang 2015), or locating a practice of natural history in early modern China (Nappi 2009).

Despite the sizable and growing literature on premodern science, technology, and medicine, much of the contemporary scholarship in the field is firmly focused on modernity. This has tended to concentrate on a handful of centers of attraction, including a nineteenth-century engagement with modern science and translation of English- and European-language materials (Tsu and Elman 2014; Wu 2015), a twentieth-century constellation of concerns with science, modernization, politics, and the nation-state, and a twenty-first century story that moves further away from understanding China in civilizational terms and toward appreciating science, medicine, and technology in China as it is already part of a plural global story (Zhan 2009).

What all of these modes of periodizing the history of science, technology, and medicine in China have in common is a turn toward attending to the problem of “tradition” and its discontents. By and large, historians have moved away from an approach to Chinese science that takes for granted a stable tradition that can be firmly located in time or space, instead conceptualizing Chinese “tradition” as a notion that has constantly been made and remade to suit the purposes of particular groups or individuals. Much of the most innovative work along these lines has emerged out of the study of another important locality for the history of Chinese sciences: the body.

### The body

A great deal of recent work on science, technology, and medicine in Chinese history has focused on the body as a site and instrument for knowledge and practice. The best of this work has eschewed past tendencies to characterize a singular “Chinese body” (be it medical, traditional, social, or otherwise) in favor of an approach that looks carefully at the plurality of bodies, body concepts, and bodily experience that have characterized Chinese history.

Much of the historical work along these lines has been inspired by anthropologists of Chinese medicine who have paid critical attention to what, where, and how bodily experience comes to matter in China, especially as that experience is and has been shaped by particular kinds of relationships (Lock and Farquhar 2007). The relationship between patient and physician is one important space for generating bodily knowledge, often in the context of some sort of a clinical encounter (Farquhar 1994; Scheid 2002; Hsu 2010). The relationship between teacher and student in the context of health-related practices—sometimes but not always in the context of familial relationships—also produces particular modes of understanding and experiencing bodies (Sivin 1995; Hsu 1999; Scheid 2007). The relationship between physical and mental health and the practices of daily life that sustain it also motivate and shape bodily experience (Farquhar 2002; Farquhar and Zhang 2012). From relationships of sex and gender come important ways of thinking and being bodies, and this has characterized our understanding of bodily health in China for as long as there have been records of practices devoted to it (Furth 1999; Chiang 2008; Rocha 2010; Wu 2010). Movement and mobility have also created particular relationships—between self and other, home and abroad, local and global—that continue to shape bodily experience and generate new ways of thinking about bodies as sites of knowing and practice (Heinrich 2008; Zhan 2009).

Institutions have also produced particular ways of conceiving the body as a space in Chinese history, and several historians of science, technology, and medicine have explored particular kinds of organizational structures and practices that have disciplined bodies in various ways. We can see some of the ways that legal institutions have accomplished this by looking at forensic practices (Song and McKnight 1981; Needham and Lu 2000; Furth, Zeitlin, and Hsiung 2007; Asen 2012). Ritual practices of various sorts also institutionally discipline and produce the body as a space, and scholars of Daoism and alchemy have been particularly active in exploring the ways that has happened in Chinese history (Sivin 1976; Schipper 1993; Strickmann 2002; Pregadio 2005; Kohn 2010). Imaging practices of various sorts were also means of disciplining bodies, whether those bodies were human, heavenly, or technological (Bray, Dorofeeva-Lichtmann, and Métailie 2007; Heinrich 2008; Kleutghen 2015). In all of these cases and more, the institutionally disciplined body has been an important locality for understanding the history of science, technology, and medicine in China. This issue has taken on particular salience in studies focused on the emergence of another conceptual locality in China, a literature so robust and substantial that it deserves its own discussion: the nation-state.

### The nation-state

Scholars of modern China have produced a great deal of work on the mutual co-constitution of science and modernity. This work on modern science and Chinese history has tended to cohere around a set of issues that take the nation-state as a foundational space, and that consequently put the history of science, technology, and medicine into dialogue with historical and area studies work on the emergence of the nation-state in China.

The making of modern science in China has gone hand in hand with efforts to translate various sorts of textual materials from Japanese, European languages, and English into the Chinese language and context. Translation was crucial to projects devoted to

reforming the Chinese state by, among other things, engaging meaningfully with ideas and technologies from what was conceptualized as the “west.” Scholars have looked closely at the ways that the work of Darwin and other scholars of evolution and society have been translated and taken up by modern makers of Chinese nationhood (Schwartz 1964; Pusey 1983; Jones 2011; Hill 2013). This resulted not only in transformations and translations of notions of nationhood itself, but also of related ideas like “nature” (Fan 2004b).

The emergence of the modern nation went hand in hand with the growth of a new notion of population and practices of disciplining and controlling it. Public health—especially in growing urban areas—was a key concept that both shaped and was produced by these practices, and the relationship among hygiene, public health, and modernity in China has been emphasized by scholars of science, technology, and medicine (Farquhar and Hanson 1998; Rogaski 2004; Leung 2009; Leung and Furth 2011). The history of the nation was also a history of the kinds of institutional means of classifying and categorizing its subjects—and thus of forming new ways of being a subject in modern China, and understanding how and why this happened—and has also been an important contribution of historians of modern science and technology (Lam 2011; Mullaney 2011). The mobilization of citizens in the production of scientific modernity was also an important part of the development of the modern nation-state in China (Schmalzer 2008; Fan 2012), and this was happening at a number of sites that included urban and rural environments, cities and villages (Fang 2012).

As scholars of modern history focus their work on the transformation from empire to nation-state in China, some historians of science have increasingly been looking for ways to situate their stories such that their histories do not assume the boundaries, identities, or disciplining technologies of the modern nation-state. This has generated a growing literature on science and empire.

### The empire

As global historians become more concerned with situating local practices and forms of knowledge within a world-historical frame, they have paid increasing attention to empire as a crucial technology for producing spaces of science, technology, and medicine. As a result, historians have a renewed appreciation of the empire as a space for the production of relationships that generated and sustained knowledge-making about the natural world and the place of people within it. Some historians of China are following this lead and turning their attention to the co-production of science, knowledge, and empire.

The relationship between “east” and “west”—especially as it has been perceived and articulated by historical actors—has been a particular area of interest and concern. A relatively expansive body of scholarship is devoted to understanding the work of European and American missionaries in Ming and Qing China, paying special attention to the translation and study of scientific texts by missionaries at the court, in the capital, and beyond. This literature has tended to look carefully at the ways that language and translation were wielded as instruments of empire and its conversions. Other work has explored the east–west relationship in the context of science and empire by considering how imperial and colonial practices in the late Qing and after helped shape the circulation of scientific knowledge. These historians have moved

away from relating the story of late Qing science and technology as a failure narrative that positions the Qing as a victim of foreign imperialisms, instead considering the circulations of goods, people, and ideas made possible by imperial and colonial encounters (Hostetler 2001; Fan 2004a; Mueggler 2011; Wu 2015). While not always explicitly framing the relationship in terms of east–west, other historians have focused on the relationship between forms of empire in China and beyond, comparing Mongol, Ming, Qing, Ottoman, Portuguese, French, British, German, and/or other imperial practices as they have shaped natural knowledge relating to ethnography, cartography, medicine, and other sciences.

A renewed commitment to studying the materials of empire has characterized recent work on the history of science, technology, and medicine in China. Historians have looked carefully at the relationships produced between China and elsewhere through the movements of particular material objects, commodities, or *materia medica*. Notable studies in this vein include works focusing on food and dietetics (Buell, Anderson, and Perry 2010), drugs like tobacco (Benedict 2011), opium, and other narcotics (Dikötter, Laamann, and Xun 2004; Zheng 2005; Kingsberg 2014), and materials like coal that were crucial to fueling China's transition to a modern nation-state (Wu 2015). Historians of medicine have also charted relationships between China and a larger global network in terms of the coproduction of geography, bodies, and disease, in particular by tracing the circulations and discourses of epidemics (Benedict 1996; Hanson 2011). Many scholars have also begun to pay careful attention to the relationship between politics, empire, and environment in shaping the history of science in China, paying careful attention to the ecological and environmental history of early and medieval China (Anderson 2014), tracing the historical consequences of environmental stress and climate change in the Yuan and Ming (Brook 2010), looking at the history of water and environmental management from late imperial to modern times (Pietz 2015), and considering the environmental consequences of modern political strategies (Shapiro 2001).

What most of the approaches above have in common is an approach to narrating the history of science, technology, and medicine in China in a way that treats empire as a crucial element in that story. As historians become more engaged in situating China within a more global history and broader related historiographical conversations, the approaches toward science and empire in those broader global contexts will continue to inform the way the history of China is understood and related.

### The future

The field, the period, the body, the nation-state, the empire: this chapter has charted only some of the multiple nested localities within which science, technology, and medicine in China have emerged, and has traced some of the ways that scientific practice and knowledge have in turn helped create these forms of space. The history of science in China has many possible futures, and there are several promising methodological directions that will help scholars map new and different forms of space than those discussed above.

This chapter opened by considering the importance of translation in shaping the localities of knowledge and practice in China. Indeed, as the field moves forward, paying more careful attention to the central role that translation has played in shaping the history of science in China will be a powerful way to open up new approaches in the field. While several scholars have explored the significance of translation to Chinese

science, more work remains to be done to open up the various forms and media that such translation might take.

Beyond the modes of periodizing science discussed above, the futures of the history of science in China will also situate the story within different periodic frames that integrate more meaningfully with periodization beyond the history of science and beyond Chinese history. We should expect to see histories of science, technology, and medicine in China that frame the story in terms of Cold War, long eighteenth century, and other temporalities moving further beyond dynastic, late imperial, and ancient, medieval, or early modern terms.

The potential futures of the field are likely also to move us beyond considering “China” as a stable and coherent kind of locality. The plural is important here: just as there is no single history of science, technology, and medicine, there is no single story that encompasses this history in relation to and in dialogue with that of China. Broader historiographical trends like the New Qing History have only just begun to reshape our narratives of the histories of science, technology, and medicine, and as this continues we will see more work on sciences in non-Chinese languages in China, more work on local histories of science within China, and more studies that query the notion of China as a historical space.

As we come to the end of the chapter, we may turn again to the beginning. Just as James Joyce’s artist progresses through a series of voices as readers follow him along the path of his story, so the voices of the history of science, medicine, and technology in China have deepened and transformed over time. And as Joyce’s story has itself continued to find new voices as it is translated into languages beyond English, so the field will continue to transform as more readers and writers translate its narratives into languages and terms that move beyond those encountered here. Like many portraits of young subjects, this chapter has aimed to capture a moment in the maturation of a still-growing field with a great deal of life yet to come.

### Notes

- 1 *Et ignotas animum dimittit in artes*: “And he sets his mind to work upon unknown arts.” See Joyce 1994, 1. For the list of localities above, see Joyce 1994, 7–8.
- 2 For the purposes of this chapter and given the nature and audience of the current volume, I restrict myself to scholars who are producing and engaging work in English. However, there are many scholars writing in the history of science, medicine, and technology and/in China who do not engage substantially with the anglophone scholarly world. The range of research questions and historiographies spanning different linguistic worlds is a massive topic deserving a chapter of its own.
- 3 This is not unique to these rubrics as they shape scholarly endeavor with regard to China: academics working on the histories of science, technology, and medicine in other geopolitical contexts have also been navigating this issue.

### Suggestions for further reading

For further work in the studies of science, technology, and medicine in China, the interested reader can consult a range of journals, monographic works, and edited volumes. Specialized journals devoted to the study of science, medicine, and technology in China include *East Asian Science, Technology, and Society: An International Journal (EASTS)*; *East Asian Science, Technology, and Medicine (EASTM, formerly Chinese Science)*; and

*Asian Medicine—Tradition and Modernity*. Relevant articles and essays can also be found in *Isis*, which can be conveniently searched via the annual *Isis Current Bibliography of the History of Science*.

The field is so broad and encompasses so many subfields and temporal scales—medicine and healing, sciences, and technologies spanning ancient, premodern, modern, and contemporary contexts—that there is not a single set of monographs or edited volumes constituting an obvious next stop for further reading. Instead, the interested reader is best served by following the works cited throughout this chapter to locate materials on particular periods or areas of interest.