# Introduction

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Innovation expresses a belief in progress, an investment in the future. Change is equated with improvement; the present is better than the past, and the future will be better still. This view of time is not that of premodern China. Scholars and doctors looked back to a Golden Age in the past. Morals were declining and, for them, time went downhill. If there was any hope for improvement, it lay in a more sophisticated understanding of ancient knowledge. Even today practitioners intent on modernising Chinese medicine declare allegiance to the canonical tradition that links them in a direct line to the legendary figure of the Yellow Emperor. So why devote a book on Chinese medicine to the topic of 'innovation'? Why discuss the many strands of an 'ancient art of healing' from the perspective of a concept that alludes to the strife of modern science and technology?[1]

The contributions to this volume were written to commemorate the initiator of a scholarly project[2] designed expressly to challenge the orientalising view of China as the exotic and remote, good for the connoisseur of art and poetry, but not for the researcher interested in the sciences and technologies that have shaped modern society so decisively. Following the lead of *Science and Civilisation in China,* this volume in memory of Lu Gwei-djen is meant to demonstrate how much is to be gained by using a broader view of science: it presents recent applications of the notion of science to comparable forms of knowledge before and outside post-Renaissance Europe, asking the same serious questions of other histories that we ask of our own.

If difference is construed in hierarchical terms, as so often in cross-cultural comparisons of intellectual, material, or social history, then of course terms like 'technological innovation' which are closely connected in our minds with our own 'scientific revolution'

[1] I am indebted to Francesca Bray for extensive work on an earlier draft. I would also like to thank my colleagues at the Needham Research Institute for their valuable comments on a more recent version.

[2] Needham, Joseph et al. (1954– ). *Science and Civilisation in China*, Cambridge University Press, Cambridge (abbreviated as *SCC*).

may simply blind us to the nature of the changes that took place in other societies.[3] We cannot expect that all societies follow the same historical trajectory, nor that a theme of research that is illuminating in one society will inevitably prove fruitful in studying another. Yet certain historical processes, in spite of their uniqueness, can have striking cross-cultural similarities. Even though the worldviews of the Chinese past differ greatly from those of the industrialised northern hemisphere in the early twenty-first century, the admittedly culture-specific concept of 'innovation', used with circumspection, opens up interesting ways of thinking about the history of medicine in China. Vice versa, the application of this concept to a premodern and non-western society can enrich our understanding of 'innovation' and the complex processes it involves.

'Innovation' was a topic central to the 'Needham question' of why modern science originated only in Europe when in fact significant technological inventions had been made much earlier in China.[4] At the end of his life, Joseph Needham stressed that Lu Gwei-djen, formerly a research student of his first wife Dorothy Needham, had been 'the dominant influence that caused him to change from being a regular research scientist . . . to becoming a historian of science in China'. Apparently, 'she worked out with Needham the subjects for a book to seek to provide an answer to the great puzzle worrying him'.[5] Among researchers in the field, Lu Gwei-djen is furthermore remembered for her contributions to the history of medicine in publications that were, however, always co-authored.[6] The one exception to this was an article on the great scholar-physician and natural historian of the Ming dynasty, Li Shizhen,[7] whose work continues

[3] Sivin, Nathan (1981), 'Why the Scientific Revolution did not take place in China – Or didn't it?' *Chinese Science* 5, 45–66.

[4] Joseph Needham is commonly known for having shown that the three technological inventions that Francis Bacon made responsible for the rise of modernity – the compass, gunpowder, and the printing press – had been invented by the Chinese already in antiquity and mediaeval times.

[5] Goldsmith, Maurice (1995), *Joseph Needham: 20th Century Renaissance Man*, Profiles UNESCO, Paris, 71.

[6] Three of these publications are in book form, namely Lu Gwei-djen and Joseph Needham (1980), *Celestial Lancets: a History and Rationale of Acupuncture and Moxa*, Cambridge University Press, Cambridge; Needham, Joseph (with Lu Gwei-djen) (1983), *Science and Civilisation in China*, vol. V: *Chemistry and Chemical Technology*, part 5: *Spagyrical Discovery and Invention: Physiological Alchemy*, Cambridge University Press, Cambridge; Needham, Joseph (with Lu Gwei-djen) (1986), *Science and Civilisation in China*, vol. VI: *Biology and Biological Technology*, part 1: *Botany*, Cambridge University Press, Cambridge. Three co-authored articles are in Needham, Joseph et al. (1970), *Clerks and Craftsmen in China and the West*, Cambridge University Press, Cambridge. For a posthumously published and updated version of five earlier publications on medicine, see Needham, Joseph (with Lu Gwei-djen), edited by Sivin, Nathan (2000), *Science and Civilisation in China*, vol. VI: *Biology and Biological Technology*, part 6: *Medicine.* Cambridge University Press, Cambridge.

[7] Lu Gwei-djen (1966), 'China's Greatest Naturalist: a Brief Biography of Li Shih-Chen', *Physis* 8 (4), 383–92.

to be celebrated in modern China and who must have been an important figure in her youth – she was the daughter of a distinguished Nanjing pharmacist.

Needham's history of the Chinese sciences is marked by a comparative cross-cultural stance with a tendency to attribute to China what Europe was not, often in idealised ways, and medicine maintained a very special place in his writings. In an article outlining an oecumenical vision of world sciences, he characterised medicine as one of the most progressive Chinese sciences.[8] He had both great awe and belief in it, and perhaps for this reason he could not terminate his researches on its history in his lifetime. This *Festschrift* in memory of his lifelong Chinese collaborator and second wife, which appears approximately at the same time as the posthumously published *SCC* volume on medicine, represents an attempt to focus on developments in medicine in their own right, without, however, entirely forestalling comparisons with the West.

Despite extensive historical research in East Asia and the West, many practitioners and large sections of the public still hold onto the illusion that 'Traditional Chinese Medicine' is five thousand years old, and that this elaborate edifice of mysticism has remained 'essentially the same' throughout millennia to the present day. Admittedly, there is written evidence of medical concerns which can be traced back thousands of years; inscriptions on oracle bones from the 14th to the 11th century BC, for instance, have been identified with Chinese characters that later appear as part of the medical vocabulary in scholarly treatises. No doubt 'medicine in China', which embraces a great variety of different therapeutic practices, is as old as 'China' itself;[9] but 'medicine in China' is not to be confused with 'Traditional Chinese Medicine'.[10] Needless to say, medical knowledge and practice, like any other aspect of society, have been subject to change.

'Innovation' is a concept more specific than 'change'. As a theme of research for more than half a century now, it has the advantage of providing researchers and readers with a well-known set of questions and reasonably differentiated problems arising from the study of science and technology in Western cultures. Even if the transposition of this

[8] Needham, Joseph (1970), 'The Roles of Europe and China in the Evolution of Oecumenical Science', in *Clerks and Craftsmen,* 396–418.

[9] Unschuld, Paul U. (1985), *Medicine in China: a History of Ideas*, University of California Press, Berkeley.

[10] The term 'Traditional Chinese Medicine' (TCM) generally refers to Chinese medicine today. Some authors consider it to reify differences between Western and Chinese but a more recent definition of TCM as the 'revived Chinese medicine that has been promoted by the government of the PRC from the late fifties onwards' overcomes this problem. For a book-length monograph on it, see Farquhar, Judith (1994), *Knowing Practice: the Clinical Encounter of Chinese Medicine*, Westview, Boulder. For the above definition, see Hsu, Elisabeth (1999), *The Transmission of Chinese Medicine*, Cambridge University Press, Cambridge, 9 and 168–223.

concept from one culture to another and from modern to premodern times poses problems, they are not insurmountable. This transposition is moreover facilitated through recent developments within the history of Western post-Renaissance science, and alternative ways of accounting for artefacts and events generally considered as 'innovative' are now outlined by historians – some of them known as 'anthropologists of science' – who study 'innovation' but barely mention the term.[11]

## Innovation

Historiography that explains historical changes by indicating solely the conditioning or causal factors, particularly demographic and economic ones, has long been found too simplistic. It was in the course of criticising such a view of history that Schumpeter gave the frequently cited definition of innovation as 'the doing of new things or the doing of things that are already being done in a new way'.[12] He pointed out that there were 'different kinds of reaction to changes in "condition" ' and proposed to distinguish between 'adaptive responses' and 'creative responses', the latter being responses that led to innovation.

The 'creative response', according to Schumpeter, had 'three essential characteristics': it could be understood only *ex post* and practically never *ex ante*; it would shape the course of subsequent events and their long-term outcome; and, admittedly to varying degrees, it depended on the quality of available personnel and individual decisions, actions, and patterns of behaviour. Schumpeter invoked the notion of innovation in the light of historical processes that one recognised as such only in retrospect and could not explain by the usual procedure of searching for conditioning or causal factors. It was a historian's concept for processes that the actors themselves might have phrased in a different vocabulary, an analytic tool of the outside observer. So, regardless of whether or not the historian is interested in the insiders' viewpoint, according to Schumpeter, certain historical processes can be described as the 'creative response' that gives rise to innovation.

As important as Schumpeter's notion of 'innovation' has remained, its flaws have long been apparent. Innovation has as its defining characteristic 'the new', and for Schumpeter 'the new' had a positive value. But people are often ambivalent towards 'the new' and in some historical periods or cultural contexts this may turn into an

[11] See for instance Shapin, Steven and Schaffer, Simon (1985), *Leviathan and the Air-Pump. Hobbes, Boyle, and Experimental Life*, Princeton University Press, Princeton.

[12] Schumpeter, Joseph A. (1947), 'The Creative Response in Economic History', *The Journal of Economic History* 7 (2), 149–59; citation from p. 151.

outright resistance to anything considered 'new'. Particularly in premodern societies 'the new' was usually not advertised as 'new'. Protagonists like Galen in the Hellenistic occident or Sima Qian in Han dynasty China – and on the medical front his spokesman Chunyu Yi – did not present their writings as innovative. They claimed adherence to tradition, and yet to a historian their writings are strikingly 'new', both in style and content. Galen, who presented himself as a commentator of the Hippocratic writings, built a scholarly edifice that was to dominate large parts of the mediaeval world and Sima Qian, who indirectly alluded to Confucius' words 'I transmit and do not create',[13] created the model for the dynastic histories of the following two thousand years. While advocating 'the old' they set the basis for 'the new'.

Schumpeter saw in the 'creative response' a change of social and economic situations 'from which there is no bridge to those situations that might have emerged in its absence'.[14] His article distinguished between the inventor and the copyist, mystified the creativity of the former as inexplicable and held imitation as something mindless and straightforward. Such an understanding of innovation is often grounded in the assumption that, due to their intrinsic superiority, inventions effortlessly diffuse into their surroundings. It postulates that some changes are qualitatively different from others, involving quantum leaps that lead to radically altered conditions; and these conditions are, in turn, often depicted as more stable than they actually are.

None of the contributions to this volume reports on an 'innovation' of that kind, and a historian of modern Western science might want to conclude that the apparent 'lack' of quantum-leap-like innovations arises from the peculiarity of the object of research: medicine in premodern China. Such a historian might take this finding as evidence for the incapacity of Chinese physicians to produce generally accepted 'paradigms' that remained stable over a certain period of time, and thereby explain the lack of 'paradigm shifts'. It is more likely, however, that this volume on innovation contains no recordings of 'innovation' in the above sense because of the contributors' scholarly attitude to time and change, and their style of writing medical history.

## Convention and controversy

The view of 'medicine in the making' that many of the articles in this book present relates to the social background, technological premises, and conventional knowledge at certain time periods, and to the kind of controversies medical practitioners and

[13] Durrant, Stephen W. (1995), *The Cloudy Mirror: Tension and Conflict in the Writings of Sima Qian*, State University of New York Press, Albany, 11.
[14] Schumpeter (1947), 150.

scholars engaged in which eventually led to the changes in medical practice and doctrine that are here offered as examples of innovation in Chinese medicine. The changes described may have been gradual or sudden, they may concern an entire system of thought and medical practice or a single artefact, they may have been instigated by a single individual or they may have happened without there being a known initiator. They concern a wide range of medical endeavour, and include changes in diagnostic methods and techniques, therapeutic practices, pharmaceutical artefacts, philosophical and medical concepts, perceptions of the body, and canonical doctrine as well as other genres of medical writing.

By conceiving of medical innovation as an interplay between convention and controversy the historian stresses the importance of social processes for technological advancement. Innovation in this sense is seen not merely as knowledge production, 'discovery', or invention. Rather, problems related to the validation of newly produced knowledge are emphasised. Since the new is not by definition better, its spread is no more viewed as a natural process of diffusion along a gradient of unequal advancement in technology, and the question is raised of why people are prepared to adopt practices with which they are unacquainted. The acceptance of new ideas and the reproduction of novel artefacts are now viewed as processes that represent a challenge; they are not intrinsically superior. Individuals and social groups receive the new in an active and selective process and they reproduce it more often than not by translation and re-invention. Exact replication has been shown to pose considerable problems; it is not the natural outcome of mindless 'copyists'. Research is thus directed away from the intellectual achievements of heroic individuals and towards institutional settings, state policies, environmental factors, economic incentive; in short, the interests of mutually interacting social groups.

The medical writings investigated in this volume are often technical and particular to a lineage of scholarship, but the nature of the material permitted investigation of the interests of the social groups who produced the medical writings. The information on the authors of the texts discussed in this volume is limited and sometimes scarce, but often it was possible to identify their social standing. A careful reading of their texts has made possible inferences of who the targeted audiences of these texts were, and who the adversaries. Even in the case of unknown authorship, attempts have been made to situate the texts within the social landscape of the period. Generally speaking, the authors of the texts discussed in this volume came from a literate elite. As a consequence, we specify that the texts in this book reflect less the history of 'medicine in China' than that of the medicine of the elite in Imperial times: the history of 'Chinese medicine'. Yet, as we shall see, this elite was diverse with regard to lineage tradition and

personal experience, functionary roles and loyalties within and towards the Imperial court, and its interests varied not only geographically but also over time.[15]

## The structure of the book

This book is divided into six parts, each comprising two articles on a related theme. These articles are arranged in the order of the events discussed. They are best read as detailed case studies that analyse important aspects of the complex history of Chinese medicine, but they do not aspire to present this history in any comprehensive way. By highlighting given conventions and controversies over them, each article addresses a change in medical doctrine and/or practice that can be viewed as innovative; 'innovation' being treated here as an overarching theme for new approaches to writing history of a premodern science.

Part I describes '*mai* 脈and *qi* 氣' as two of the most central notions that laid the foundations for Chinese medical reasoning among the medical elite in Imperial times. Even though their meanings varied with place and changed over time, and although in more recent history attempts were made to do away with these two concepts altogether, they deserve particular attention. Vivienne Lo and Elisabeth Hsu emphasise that they came to refer to subtle movements and changes imperceptible to the non-initiated, and although the two articles deal with geographically distant traditions, they both point out common aspects of a body conception in terms of the subtle *mai* and *qi*, findings which implicitly suggest that this opened up the field for medical speculation.

Numerology provides in many traditional sciences a schema for ordering knowledge and a device for speculations about the future. Correlative thinking was not specific to the science of Chinese medicine. It was, as the articles in part II of the book, on 'Correlative cosmologies', show, already prevalent among 'gentlemen with formulae', *fangshi* 方士, who predated the elite doctors in Imperial times, *yi* 醫, by several centuries and later rivalled them, not least over clientele. Donald Harper focuses on some numerological considerations in iatromantic texts on the art of prognosticating the outcome of illness and how they became integrated into medical doctrine. This highlights aspects of how the first imposition of numerology onto Chinese medical reasoning led to the

[15] 'Chinese medicine', as a term in the singular, has the danger of invoking a unity of medical practice and doctrine when this term actually refers to a host of practices that first emerged among the elite in the Western Han and can be traced to the present day in numerous lineages of knowledge transmission. Aware of the plurality of different traditions that the term refers to and the controversies between them, one may be tempted to speak of 'Chinese medicines'.

predominance of Five Phase doctrine in Han medical writings which gave rise to what is commonly known as the 'medicine of systematic correspondences'. Catherine Despeux discusses a second important event involving a numerological reorganisation in the history of canonical medical doctrine: it had its roots in the Tang dynasty and was in its full-blown form promulgated by the Song Imperial court, and led to what is known as the doctrine of the five circulatory phases and six seasonal influences (*wuyun liuqi* 五運六氣) or 'phase energetics'.[16]

Whereas the concepts *mai* and *qi* developed in the context of cautery and needling therapy and cleared the ground for medical authority to establish itself through numerologically dominated speculation, drug therapy did not play an important role in the formulation of the canonical Chinese medical doctrine and is considered for many centuries to have continued to be grounded primarily in empiricism.[17] Part III, on 'Dietetics and pharmacotherapy', contains contributions that discuss innovations within the *materia medica* (*bencao* 本草), the third of the three main traditions of medical writing in addition to those on medical doctrine (*benjing* 本經) and formulae (*fangji* 方劑). These two contributions on *bencao* literature complement each other insofar as Ute Engelhardt discusses the categorisation of foodstuffs – waterchestnut and horse liver – and Frédéric Obringer focuses on a variety of rather toxic substances – arsenic compounds – and the innovative but short-lived technique used to produce them. Their juxtaposition highlights the general ambivalence that Chinese physicians had to drugs (*yao* 藥) and alchemical traditions of drug intake.

In Late Imperial China the era of the Han was often appraised as that of the genuine and original doctrine of Chinese medicine, and later writings were degraded to mere amendments. The two articles on 'The canons revisited' in part IV show that the reappraisal of canonical works in fact consisted of virulently innovative scholarship. The posthumously published *Bencao gangmu* 本草綱目 (Hierarchically Classified *Materia Medica*) (1596) by Li Shizhen 李時珍 (1518–93) represents the pinnacle of the Chinese *bencao* literature. While this text is firmly grounded within the medical tradition, Georges Métailié has repeatedly stressed its importance for the emergence of Chinese studies in natural history and the article in this volume provides ample evidence to corroborate his claim. Similarly, the *Shanghan zabing lun* 傷寒雜病論 (Treatise on Cold Damage and Miscellaneous Disorders) written by Zhang Ji 張機 in the Eastern Han is still today considered the most important work of the formulae

[16] Term used by Porkert, Manfred (1974), *The Theoretical Foundations of Chinese Medicine: Systems of Correspondence*, MIT Press, Cambridge, Mass., 55–106.

[17] According to Unschuld, Paul U. (1986), *Medicine in China: a History of Pharmaceutics,* University of California Press, Berkeley, 112, the first 'pharmacology of systematic correspondences' dates to the Song.

tradition of medical writing. It was lost but reconstituted in the Song and, as Marta Hanson shows, its reappropriation by scholar–physicians of the Jiangnan area in the Ming and Qing led to the formulation of the medical doctrine of warmth factor illnesses (*wenbing xue* 溫病學) that ever since has rivalled the pre-eminence of the cold damage tradition.

Whereas the two articles on the canonical *grands oeuvres* required extensive discussion, thereby reflecting the enormous wealth and complexity of knowledge they dealt with, part V, on 'Medical case histories', consists of articles of remarkable brevity and conciseness, by Christopher Cullen and Bridie Andrews. These two articles discuss Chinese physicians who themselves were much concerned with clarity in knowledge presentation and who outlined new ways of structuring information derived from the clinical encounter. Endeavours of this kind, which in the Ming gave rise to a new medical genre, are followed up through the Qing to the Republican period, where the adjustment to Western biomedical practice resulted in interesting modifications. While they have indeed led to a more direct integration of knowledge from treatment of individual cases, they are also shown to provide a standard schema for recording experience in medical practice.

The book ends with a section on 'Medical rationale in the People's Republic', part VI, which not only points out adjustments to a new political style but also indicates much diversity of current medical practice. Kim Taylor's article focuses on a politically motived Western medical doctor who epitomised the movement of 'new acumoxa' (*xin zhenjiu* 新針灸) in the late 1940s and early 1950s and Volker Scheid compares two Chinese medical doctors and their prescriptions for treating dizziness (*touyun* 頭暈 and *xuanyun* 眩暈 respectively) on the basis of ethnographic fieldwork in the mid-1990s. The controversies over Chinese medical practice that these two articles address are strikingly different. Where Taylor highlights unification through political indoctrination, Scheid emphasises pluralism in government-run institutions; where Taylor mentions application of the Soviet sciences, Scheid stresses adaptation of Western medicine; and where Taylor shows how canonical knowledge was done away with, Scheid delves into tracing medical lineages and establishes genealogies of drug prescriptions. These changes of recent decades involve an accentuation of those of the previous two millennia.

## Innovation, convention, and controversy

The student interested in the history of science may wonder what can be learnt from this inquiry into a premodern non-Western medical science. It is futile to try to summarise the multilayered articles of this volume in one final paragraph, for the changes

identified as 'innovation' are rather diverse in kind. Nevertheless we may note that one of the most frequently encountered innovations discussed in this volume arises from combining knowledge from different traditions of learning. This combination of knowledge sometimes led to the emergence of a novel doctrine or a new literary genre. Another kind of medical innovation consisted of the reordering and reinterpreting of existent medical knowledge that gave rise to entirely new fields of inquiry. It could also involve a formulaic structure for presenting already existent knowledge, an aspect characteristic of medical case histories. Numerological systematisation was yet another form of such formulaic knowledge presentation, and the two chapters treating innovations of numerological systematisation (in part II) discuss two of the most important and long-lived innovations in Chinese medical doctrine. Notably, most of the articles are concerned with innovation in 'literary technology' and only one deals with a technical invention. Given that some of the articles point to the self-awareness of the actors that they were doing something new, while others identify an innovation, often on structural grounds, without having any information of the actors' attitude at all, we acknowledge that in this book the notion of innovation has been applied to a premodern science, regardless of whether the innovation was proclaimed as such or not.

## Editor's note

This book brings together research on Chinese medicine from fairly different strands. Given the variety of translations of Chinese medical terminology – most notably by Manfred Porkert, Paul Unschuld, and Nathan Sivin – and the continuing search for adequate translation, I promised from the very start not to impose adherence to a particular terminology throughout the book. For the reader this means that the same Chinese medical term may be approximated in translation by a whole variety of different English words. Therefore great editorial effort was directed at giving a Chinese medical term both in the official transcription system *pinyin* (also in citations originally given in other transcription systems) and in Chinese characters. This should allow the reader to recognise the same term even when its translation varies in different articles.

I also refrained from standardising the translation of book titles and from imposing use of particular editions of the Chinese works – it is a regrettable but dire reality for researchers on Chinese medicine that some of the best editions of canonical works are not widely available. Dates of composition, compilation, or publication are similarly difficult to standardise, and I have adopted the dates given by the individual authors. Book and chapter titles are therefore consistently referred to by their Chinese names, and only well-known works, such as the *Yellow Emperor's Inner Canon* (*Huangdi neijing*) and the like, are first mentioned in English.