

The “Why not” Question of Chinese Science: The Scientific Revolution and Traditional Chinese Science¹

Yung Sik Kim

[Yung Sik Kim is Professor in the Department of Asian History and the Program in History and Philosophy of Science, Seoul National University. He is the author of The Natural Philosophy of Chu Hsi (Philadelphia: American Philosophical Society, 2000). His research interests are traditional Chinese sciences and natural philosophy, Korean science and technology, and comparative history of science.]

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1 Introduction: Various Forms of the “Why not” Question

A question that comes first to mind when many people speak of Chinese science and natural philosophy is the so-called “why not” question, namely, 1) “Why did the Scientific Revolution not take place in China?” or 2) “Why did modern science not develop independently in China?” When I say, usually during quite casual occasions, that I am working on Chinese science, this is almost always the first question that people come up with to confront me.

The question was first asked by the Chinese themselves in the late nineteenth

¹ Various earlier versions of this paper were presented in seminars, colloquia, and as lectures over the past few years at the University of Munich (Institute for East Asian Studies), University of Tübingen (Seminar for Sinology and Korean Studies), National Tsinghua University at Hsinchu (Institute of History), Seoul National University (History Faculty Seminar), The Academy of Korean Studies (Department of Philosophy), Tokyo Institute of Technology (Science and Technology Studies), Tsinghua University at Beijing (Institute of Science, Technology and Society), and at the Ninth International Conference for the History of Science in China (Hong Kong). I would like to acknowledge the benefits I drew from the discussions on these occasions. Critical comments of one of the referees helped me see problems existing in the manuscript and clarify a number of points.

and early twentieth centuries, when China fell prey to Western powers. The Chinese of the time felt that this was largely because of the successful development in the West of science and technology, which the Chinese themselves had failed to develop, at least not in the "right" direction. This perception led many Chinese to strive for the strengthening and enriching of their country by developing science and technology. But it also made them ask why science and technology were not developed in China. Some even asked a more extreme form of the question. Fung Yu-lan, for example, titled one of his articles as "Why China has no science?"²

Gradually, however, people came to realize that scientific and technological traditions did exist in China that were fairly sophisticated and advanced, and as a result various different forms of the question have emerged. Joseph Needham, perhaps the one most responsible for such a shift in the general evaluation of Chinese scientific achievements, has put the question in the following way: Why did China fail "to give rise to distinctively modern science while having been in many ways ahead of Europe for some fourteen previous centuries?"³

There have, of course, been other forms of the question, some of which are quite interesting. Some have asked more specifically why the scientific activities in China did not continue or prevail. For example, Robert S. Cohen, a philosopher, phrased the question as: "China amply, confidently and splendidly reached the threshold of modern science and technology but no further, and why not?"⁴ For another philosopher, Arnold Koslow, the question is: "Why, given the state of knowledge in Ancient and Medieval China, was there a discontinuance rather than a continuation of the tradition in (say) optics, acoustics, and mathematics?"⁵ A historian of the Scientific Revolution, H. Floris Cohen, asked: "Could a Galileo have emerged in China, and if so, could he have prevailed?"⁶ Sometimes a potential answer to the question is expressed in the form of a "why not" question: "Why did scientific activity become functionally differentiated and institutionalized in Western Europe and not in China or elsewhere?"⁷ What may be the most neutral, but perhaps the least interesting, form is my own: "Why did the Chinese develop their knowledge of the natural world in the way they did and not in the way the Europeans developed modern science?"⁸

In this paper, rather than asking, and trying to answer, the "why not" question

² Fung (1922). Homer H. Dubs even referred to the Chinese "failure to produce philosophical systems": Dubs (1928).

³ E.g. Needham (1974), p. xxiii. Of course, Needham formulated the question in many different ways. Sal P. Restivo, for example, identified twelve such "formulations." See Restivo (1979), pp. 43-44 (appendix A).

⁴ Robert S. Cohen (1973), p. 104.

⁵ Koslow (1975), p. 185.

⁶ H. Floris Cohen (1994), p. 483.

⁷ Restivo (1979), p. 29.

⁸ Kim (1982), p. 103.

again, I shall examine the problems—both theoretical and practical—involved in asking and answering the question. I shall look at various criticisms of the question and examine the validity of such criticisms. I shall take the question as an example of the general question, “why not an event E in culture A?”, and show how the natures of the event E and the culture A influence the way one goes about dealing with the question. Problems can be found not just in the question but in the answers that people have looked for and have come up with. I shall also examine such problems. Finally, I shall consider the ways in which the question and answers to it can be, and have been, useful in spite of so many problems. I shall end the paper with a discussion of what can be called the “Korean why not question.”

My purpose in doing all this is to suggest that we cannot afford to write off the “why not” question. The widespread awareness of the potential problems of the question in the past few decades has discouraged students of the history of Chinese science from asking the question itself. We now see hardly anyone raising the question in serious professional discussions, except for occasional examinations of the legitimacy of asking the question itself that usually end in banning the question as an illegitimate question to discuss. An unfortunate consequence of this, however, is that while the scholars in the field, in all possibilities the very ones most qualified to ask the question, and most prepared to deal with the dangers involved in asking the question, are abstaining from asking it, numerous others are asking, and answering, the question.

2 Targets of the “Why not” Question

The first thing we may note about the “why not” question is that it is not asked with respect to just any culture. Typically, it is asked with respect to a culture 1) when the science of the culture seemed so close to a “Scientific Revolution” but did not cross the “threshold”; or 2) when other areas of the culture were so advanced that it makes one wonder why its science was not so. Actually, China, India, and Islam are just about the only cultures for which this grand question is asked, and of these, China is by far the most frequent target of the question. It is obvious that for many people China appears to meet both of the above two criteria. 1) For a long period in Chinese history there were traditions of science and technology at quite advanced levels, such as calendrical astronomy, mathematics, medicine, pharmacology, harmonics, and various techniques. 2) The Chinese have shown abundant activities and impressive achievements in other cultural areas, like philosophy, arts, government, industry and economy.⁹

On a more restricted scale, the question is also asked for such other cultures

⁹ This was especially so in the eleventh century during the Song, the period which some scholars even characterized as “the early modern” China. See, e.g., Reischauer and Fairbank (1958), pp. 220-225.

as those of seventeenth-century China, the Sejong (r. 1418-1450) era of Korea, and Tokugawa Japan.¹⁰ Sometimes the “why not” question turns into questions of “why stagnate” or “why decline”: “Why did science stagnate (or decline) in a culture?” And this “why stagnate/decline” question has been asked, for example, for the sciences of ancient Greece, Islam, Ming China, and the post-Sejong period of Korea, etc.¹¹

3 Problems in the Question

Some see problems in the question itself, and wonders whether it can be a meaningful question at all.

3.1 Inherent Problems and Underlying Assumptions

Problems can be found concerning all three components of the question: 1) “why not”; 2) “Scientific Revolution”; 3) “in China”. Many are, for example, sceptical about the term “Scientific Revolution”, and wonder whether it is a meaningful term even in the West.¹² Some question the validity of the notion of the “Grand Divide” between “China and the West” as the basis for historical analysis.¹³ But even if one leaves aside such scepticisms that have become fashionable in recent years, and admits that one can, as I shall do in the remainder of this paper, legitimately speak of “Scientific Revolution” and compare “the West” and “China,” there is a problem inherent in the first component of the question, namely whether it is meaningful to ask why something did not happen.

To illustrate the problem A. C. Graham came up with the striking analogy of a house-fire. Noting that when a house caught fire one does not go through all the other houses in the street explaining why they did not catch fire, he asked why one should do a similar thing in the case of the Scientific Revolution? Naturally, he went on to argue that what needs to be asked is not “why the Scientific Revolution did not” take place somewhere, but “why it did” take place where it did,

¹⁰ E.g., Sivin (1973); Chōn (1966), pp. 23-25; Bartholomew (1976).

¹¹ For discussions of such questions, see, e.g., H. F. Cohen (1994), Section 4.2; Sabra (1987); Hart (forthcoming); Pak (1995), esp. pp. 165-166. It should be noted that, in speaking of these questions, I am not implying that decline and stagnation are the sole alternatives to scientific revolution. The science of a society can continue to grow at a slow pace without leading to revolutionary breakthroughs.

¹² Shapin (1996), “introduction”; Lindberg (1990).

¹³ Hart (1999). Karine Chemla also raised this question while commenting upon an earlier, oral, version of the present paper.

i.e. in Europe.¹⁴

The basic criticism along these lines is that in asking why an event E did not take place, the question contains the implied assumption that it is natural that E should have happened. In the case of the “why not (a) Scientific Revolution” question, for example, the implied assumption is that the Scientific Revolution is something that should occur in every culture at a certain stage of its scientific development. And we know that this assumption is mistaken, for, as Graham points out, nowhere was the Scientific Revolution an event that had to occur naturally, not even in Western Europe where it actually occurred.

3.2 “Why E” = “Why Not (Not E)”

Yet, the above criticisms do not constitute a sufficient reason for us to avoid the “why not” question altogether. We can still ask the question while not accepting the sort of assumptions above. Furthermore, if anyone, based on such a theoretical criticism of the “why not” type question, insists that only the “why” question should be asked, I have an equally theoretical counter-argument, namely that there cannot be an absolute distinction between the “why” and the “why not” questions, for one can take any “why” question and turn it into a “why not” question:

“why E” = “why not (not E).”

Should we, then, criticize those asking “why E” for asking a “why not” question, namely “why not (not E)”, and thus for assuming it natural that “not E” should have happened (or that E should not have happened)?

The above equation, although it may appear strange at first sight, is quite plausible in the cases where “not E” is more natural than E, for then one will want to ask about the causes for the less natural event of “not (not E)”, which is E. The “why the Scientific Revolution” question could be considered such a case, because, as we have noted, the Scientific Revolution is not an event that can be expected to occur naturally in any culture: indeed, it can be said that it is more natural for a culture not to have a Scientific Revolution. Thus, one may naturally ask a “why not [not E]” question: “Why did Western Europe not enjoy the natural state of not having the Scientific Revolution?” An interesting example of asking this form of the question is William Theodore de Bary’s following remark, which, though it might at first appear odd, contains a wholly natural question to ask, and thus nicely supports my point here.

... it could be asked, in slightly modified non-Western terms
(in this case, the normative Neo-Confucian language of East

¹⁴ Graham (1973). The “house-fire” analogy appears on p. 51.

Asia): why could the West not measure up to the civilized behavior of Confucian East Asia? Why did it not act in a mature, responsible way by getting its own house in order and staying home, as China, Japan, and Korea were doing, rather than chasing around the world to make trouble for others?¹⁵

In fact, many events in history can be of this sort. Unless one has a sufficient reason to consider any given historical event “E1” as a natural, or even an inevitable, event to occur in every culture, “not E1” could be considered more likely. Of course, assuming “not E1” and asking “why not (not E1)” is a more plausible thing to do in such cases, rather than assuming “E1” and asking “why not E1.” Nevertheless, asking “why E1” can in principle be criticized for asking a “why not” question (why not [not E1]) and as a case of an assumption (that “not E1” should have happened) underlying the question.

3.3 The Nature of the Scientific Revolution

The above discussion must have made it sufficiently clear that in asking and answering “why not E,” a great deal depends on the nature of E. One’s notion of the nature of an event that did not happen influences greatly the way one goes about dealing with the question of “why it did not happen.”

Yet, E in the “why not E” question is not an event that can be discussed in isolation—in general, abstract terms—it is a concrete event in a particular cultural setting. In other words, what we refer to as “why not E” really is “why not E in culture A.” It thus depends very much on the culture about which the question is asked.

For example, in asking “why not E” one can distinguish a culture in which E did not happen but still could have happened on the one hand, and a culture in which E could not have happened at all on the other. Some think that Islam and China were different in this respect: when E is the Scientific Revolution, Islam is the former kind of culture, and China the latter. Among other things, it is noted that Islamic culture shares some intellectual foundations with the West, which did undergo the Scientific Revolution.¹⁶ If we accept this, we can conclude that, of the two non-Western cultures, considerations of Islamic culture will yield intercultural understanding more readily transferable to the situation in the West. But this argument involves the same kind of assumptions as have been criticized in the previous subsection.

Perhaps one may be tempted to consider the Scientific Revolution to be an event that could have occurred only in Western Europe of the sixteenth and sev-

¹⁵ de Bary (1988), p. 68.

¹⁶ H. F. Cohen (1994), p. 143.

enteenth centuries, and then the question will not need to be asked with respect to other cultures. But if we do not go that far and admit that it can happen in cultures other than early modern Europe, what kind of “Scientific Revolution” are we talking about when we ask the “why not (a) Scientific Revolution” question? Are we speaking of the Scientific Revolution (E) that actually happened in Western Europe (B)? When we know that E happened in B and ask “why not E in A,” are we asking “why not [E in B] in A”? In other words, is there only one particular form of E (“E in B,” namely the E which actually happened in B) that can happen anywhere in the world? And if so, can it happen in other cultures—can “E in B” happen in A? Or is it possible that there is more than one form of E? For example, can there be a form of E which is different from the actual “E in B” and that can still happen somewhere in the world (although it actually did not happen anywhere)?

One aspect of the Scientific Revolution can be noted in this connection, namely that the peaks of the developments in Europe that constituted the Scientific Revolution were not followed by consolidations or stagnations, or even declines. That was what actually happened in nearly all other cases of scientific flourishing in history—ancient Greece, medieval Islam, and Song China, for example. Indeed, this pattern of intermittent growth between periods of stagnation, and even decline, is much more common than what happened in Europe after the Scientific Revolution. It is notable, then, that unlike those other cases where a flourishing scientific development reached a peak after a while and then slowed down in a few hundred years, the developments that had begun during the European Scientific Revolution continued and even accelerated. And they spread over the rest of the world.¹⁷

3.4 Misunderstanding the Scientific Revolution

Naturally, a misunderstanding of E in the question “why not E” will pose problems. For example, inaccurate understanding of what happened in Europe during, and before the Scientific Revolution has led to all sorts of wrongheaded speculations concerning the “why not (a) Scientific Revolution” question. The most frequently found such misunderstanding is the assumption that the sciences of all traditional cultures were more or less similar up to the fourteenth and fifteenth centuries, just before the Scientific Revolution, and that after this only European science took off. We know that this is wrong; we know that there were in fact a lot of differences—both in content and in context—between medieval Western science and traditional Chinese science.

¹⁷ To be sure, if we look at individual countries like Italy or England, there were indeed periods of stagnation and decline. But science flourished in other parts of Europe. One may ask whether the pluralism of Europe helped maintain the pace, or even accelerate it, as is commonly assumed.

One notable such difference was that in the medieval West natural philosophy was accepted by the universities and formed an essential part of their curriculum. Natural phenomena were thus frequently discussed, and often became subjects of heated debates among the medieval schoolmen. The situation was very different in traditional China. This is not to say that subjects dealing with the natural world were not accepted by the intellectual mainstream in China. They were accepted; or at least, they were not excluded. Nor is it my point that objects and phenomena in the natural world were unimportant to traditional Chinese thinkers. They were important also. The point is, rather, that they were unproblematic. Natural objects and phenomena were not excluded, but were taken for granted, and hence simply accepted as they were observed, reported, or recorded. It is for this reason that, while there were heated discussions and long-running debates on moral and social problems among traditional Chinese thinkers, natural phenomena were not very often discussed or debated in this manner. Natural philosophy did not belong to the list of subjects for which they showed much enthusiasm.¹⁸

A corollary of this misunderstanding of taking all traditional sciences to be more or less the same is the belief that modern science came about owing to a new scientific methodology. For Needham and for many others, for example, modern science was the result of the combination of mathematics and experimentation.¹⁹ We know, of course, that the real situation was a lot more complicated. Another kind of such misunderstanding is the belief that continuation of scientific development would have eventually produced a Scientific Revolution. Concerning this we may ask, as Arnold Koslow has done, "Why should Chinese [scientific] traditions, even if they continued, broadened, and deepened, lead to what has been called modern science?"²⁰ Still another kind of misunderstanding is to confuse scientific development (revolution) and technological development (revolution). Many factors have been proposed that could be significant in explaining the development of technology, but not that of science, which in traditional China, as in most other traditional cultures, was an activity largely separate from technology. Benjamin Nelson has noted, for example, that it is easy to see some roles played by capitalistic interest in technical utilization of scientific knowledge, but not so to see its role in science *per se*.²¹

¹⁸ This is evident, for example, in the manner in which Zhu Xi 朱熹 (1130-1200), the creator of the so-called "Neo-Confucian synthesis," discussed natural phenomena. Frequently, he spoke of them not for their own intrinsic interest, but for some external purposes. He alluded to familiar and obvious natural phenomena mainly in dealing with certain moral and social problems, drawing analogies between these natural phenomena and usually rather complex and difficult moral and social problems. Only rarely did he mention such common natural phenomena for their own sake. For more detailed discussion of this point, see Kim (2000a), pp. 3-4.

¹⁹ E.g., Needham (1959), pp. 150-168.

²⁰ Koslow (1975), p. 185.

²¹ Nelson (1974), p. 463.

These are only the more frequent examples of misunderstandings concerning what happened in the Scientific Revolution. Such misunderstandings have misled numerous questioners and answerers of the “why not” question, and their readers. But still, this does not constitute a sufficient reason to ban the question; it only emphasizes the importance of having an accurate understanding of the nature of E when asking “why not E.”

3.5 “Why Stagnate/Decline” Question

In principle, the “why stagnate” or “why decline” questions suffer from the same problems that have been discussed concerning the “why not” question. One particular aspect becomes significant for these types of question, namely the apparent connection of the flourishing and the decline of a culture at large and that of the science of that culture. We may ask whether science continues to flourish while all other areas are in decline—in ancient Rome, for example. If it can, it may mean that science is a unique branch of culture, different from other branches.²² But we can also ask the reverse question: can science alone decline in a culture while other areas of the culture flourish? As we have noted in section 2, asking the “why not” question presupposes not only that it can, but also that it actually did in China.

Another point to be noted is that while “stagnation” or “decline” of science may often be the result of rejection and suppression, it is not always so. Frequently, stagnation or decline is the result of simple neglect, or ignoring, rather than active rejection or suppression. Sometimes it can result from an acceptance followed by isolation and stabilization. We can think of the sciences in Islam and in post-Song China as examples of such cases of decline resulting from isolation or stabilization. In the former case, science was accepted by isolated, marginal intellectual circles of society; in the latter, scientific knowledge entered, and became part of, the comprehensive corpus of learning, and was taken for granted by the intellectual mainstream.²³

4 Problems in the Answers

It is not only in the question that problems have been found. They have also been found in the answers people have looked for, and have found.

²² One such example would be elite competition sports. Can science, or certain aspects of science, then, be considered to be similar to elite competition sports?

²³ Sabra (1987); Kim (2000a), pp. 6-8; Kim (forthcoming).

4.1 Answers Required for the “Why Not” Question

There have been problems in ideas about the conditions that the answers to the “why not” question should satisfy, in other words, in the notions people have concerning the kind of answers the question requires. Some think that what is required as answers to the “why not” question are “causes” that can provide a rigorous causal explanation. H. F. Cohen illustrates this problem by rephrasing the “why not” question of ancient Greek science in the following manner: “What, in other words, was absent from Greek science that was indispensable for bringing forth early modern science?”²⁴

But this is usually not what we are looking for when we ask the “why not” question. For example, in asking “why not E in A,” we are not looking for necessary and sufficient conditions for E to occur, ones which did not exist in culture A and thus prevented E from occurring in A (or caused “not E” in A).²⁵ After all, we do not seek such “causes” when we ask “why” questions in history: “Why the French Revolution?”, “Why the Ming collapse?”, for example. And what people have actually come up with as answers to this kind of question are not necessary and/or sufficient conditions, but are various other sorts of things: influences, reinforcements, correlations, connections, linkages, and even coincidences, for example. There is no reason, then, that we should insist that we should find more rigorously causal “causes” for the case of the “why not” question.

4.2 The Problem of “Inhibiting” Factors

Many attempts to produce answers to the “why not” question have suffered from a common problem, namely that of seeking “inhibiting” factors as answers to the question. It is a problem because this amounts to saying that a factor inhibited something that was not happening, and thus makes one wonder whether it means that the Scientific Revolution was about to happen, or was in progress, in China, and then was inhibited by the inhibiting factor. What is more serious, however, is that the inhibiting factors people have suggested as answers to the question have

²⁴ H. F. Cohen (1994), p. 242.

²⁵ After considering science in Islam, H. F. Cohen lists four features that affect the development of science in general, of which three are given in the form of necessary conditions for a Scientific Revolution to occur: 1) “that science not be perceived by the community at large as being directly opposite to its core values”; 2) the existence of “at least semi-professional cluster of scientists who exude a deep and abiding belief in the value and dignity of their own life’s work”; and 3) that “no Scientific Revolution is feasible ... in lands thoroughly destroyed by bands of foreign invaders.” The fourth feature speaks of conditions that would give a society “a decisive advantage when it comes to preparing the ground for early modern science.” See H. F. Cohen (1994), p. 417.

frequently been the absence, rather than the presence of certain factors. For example, the inhibiting factors suggested so far have included the absence in China of such ideas as causality, laws of nature and a creator-god, such methodological elements as proof, formal logic, geometry, symbolic algebra, and experiment, and such social and cultural factors as capitalism, urbanization, the merchant class, slavery, universities, organized religion, individualism, tolerance, etc.²⁶ But taking the absence of something as an inhibiting factor really amounts to saying that the absence of a factor inhibited something which did not happen after all.²⁷

4.3 Mistaken Assumptions and Other Problems

A still more serious problem that can be found in the answers given so far to the “why not” question is the one that has plagued comparative historians of science, namely the assumption that a factor, an aspect, or a situation should play the same role in every culture, in particular the assumption that the factors that were significant in Western scientific development are the factors that must have affected the development of the sciences of China in the same ways also. That this assumption is mistaken can easily be seen from the simple fact that many aspects or situations similar to the ones suggested as answers to the Chinese “why not” question were present in the West before the Scientific Revolution, but did not prevent the development of modern science there.²⁸

Obviously derived from the above sort of assumption is a frequently found trend to attribute the supposed lack of scientific development in China to the

²⁶ For discussions of these and many other factors, see, e.g., Needham (1969); Bodde (1991); H. F. Cohen (1994), Section 6.5. A rare exception in which presence of a factor was given as an inhibiting cause was the bureaucracy. For discussions of the role of the bureaucracy in Chinese scientific development, see, in addition to the above cited works, Kim (2000b).

²⁷ Along this line, Nathan Sivin has identified “two fallacies” frequently found in intercultural comparisons: 1) taking an earlier state as “necessary condition”; 2) taking later absence as a result of “inhibiting.” See Sivin (1982), p. 56.

²⁸ Taking the example of the supposed inhibiting role of the “scholar-bureaucrat class,” Nathan Sivin has underpinned this point in the following manner:

But in Europe at the onset of the Scientific Revolution we are faced with the predominance of the Schoolmen and dons, immersed in books, face toward the past, and oriented toward human institutions rather than toward Nature. They did not prevent the great changes that swept over Europe. It would take a more imaginative historian than myself to say whether those changes would have taken place sooner had Scholasticism never existed. (Sivin 1982, p. 57.)

different characteristics of some cultural elements or aspects in China from those in the West. Examples are numerous: the Chinese conception of cyclical time vs. the Western conception of linear time; the non-inflective Chinese language vs. the inflective Western languages; the strength of Chinese mathematics in algebra vs. the Western strength in geometry; the Chinese inclination to wave theory vs. the Western particulate theory in explaining physical phenomena, and so on.²⁹

There are, of course, other problems that can be found in the answers that have come up so far. In an interesting philosophical analysis of the problems involved in answering the question, Robert S. Cohen wonders: “what is the sort of connection which can affect one layer of social action by thought, feeling or action at another layer?”³⁰ He points out, for example, the difficulty of establishing the comparability of cultural variables in different historical settings. He criticizes the “fuzziness” of the answers, or the “imprecise characterization and explanatory status of cultural variables” contained in the answers. For some of these variables may be merely “intervening variables, convenient conceptual stand-ins” that have to be replaced later, and some even candidates of “why” and “why not” questions.³¹ He also points out the problems in what he calls the “causal conditional arguments” employed in these discussions.³²

The problems discussed in this section underline the real dangers faced by those who try to answer the “why not” question. Numerous attempts to answer the question have been misled because of these problems. Yet, the existence of the problems should not lead us to reject the question itself. They only remind us that we should be mindful of the dangers in answering the question, especially of coming up with simple, easy answers.

5 Contribution of the Question

There is still another problem—perhaps the most conspicuous problem—with the question, which is that so many people keep asking this question that has so many problems. The questioners include not just laymen, but many scholars also; in fact, nearly everyone interested in Chinese culture has asked and answered the question. And this situation is likely to continue. We might succeed in persuading one another to avoid asking the question, or at least to wait until the time when we understand enough—which, by the way, will never happen! But meanwhile the question will not go away, and numerous other people will ask and answer the question. Why do people keep asking this question?

²⁹ E.g., see Needham (1969); Bodde (1991); and H. F. Cohen (1994).

³⁰ R. S. Cohen (1973), p. 106.

³¹ R. S. Cohen (1973), pp. 108-109.

³² R. S. Cohen (1973), p. 111. Cf. Koslow’s comments on Cohen’s paper in Koslow (1975).

It is difficult to deny that many people, at least those who keep asking it, must have felt that the question has some contribution to make to a better understanding of something, be it scientific development in China (or in other places), the nature of scientific enterprise, Chinese culture in general, or something else again. Can we discount their feelings by simply saying that they should not succumb to such feelings because the “why not” question cannot contribute anything to their understanding? Can we say for sure that the question has indeed made no contribution to the field of Chinese science? I do not believe we should be so negative in assessing the contribution of the question.

A undeniable contribution of the “why not” question is that it has provoked interest in Chinese science for many people, and an initial motivation for many who work in the field—whether they recognize it or not. It is only after grappling with the question for some time that they come to realize the problems in asking—and answering—the question. For example, only after asking the question, and trying out various answers to it, do they realize the danger involved in assuming that the Scientific Revolution is what should happen at some stage of every culture.

Another important contribution made by the “why not” question is that it has led many historians of Chinese science to consider, while trying to find answers to the question, not only the contents but the contexts of Chinese science. The belief of many of them that the answer to the question should be found mainly in factors external to science itself—intellectual, social, institutional, and other cultural factors—is not entirely correct. But such belief has encouraged—and will continue to encourage—much good work on the role of such factors in the development of science in China.

The question has also led many people to do comparative history of science, because the answers to the “why not” question are usually based upon, and sometimes tested by, comparative analyses of the situations in different cultures, usually comparisons with Europe, where the Scientific Revolution did take place. Such comparisons, when carried out prudently, have contributed greatly to a better understanding of the various differences between the two cultures, and eventually to a better understanding of the two cultures themselves. The differences we have seen between the two cultures in concepts of time, language, the nature of mathematics, and so on, were the fruits of such comparisons.³³

Perhaps the most important contribution, however, should be found in the answers that people have come up with so far. And that is the way it should be after all. Whatever problems they may have as answers to the “why not” question, numerous factors, aspects or situations in traditional Chinese science, society,

³³ More recently, G. E. R. Lloyd has described the difference in the dominant modes of intellectual argument between the two cultures, noting Chinese appeal to authority vs. the Western predilection for “polemical argumentation.” See Lloyd (1996).

and culture have been suggested, studied and discussed.³⁴ To be sure, any one factor, aspect or situation by itself cannot be the whole answer. But each of these factors can explain, at least to some extent, the lack of the scientific development or the absence of the Scientific Revolution. It will be difficult to say that a particular factor did not—or even could not—have any effect in the development of science in China, or anywhere else. Indeed, the factor did exert an effect on scientific development in a concrete, particular (peculiar) historical context of traditional Chinese culture and society. And as the result of those various factors appearing together in such historical contexts, and acting together in combination in very complicated ways, they affected Chinese scientific development in certain ways.

It is quite likely, then, that in trying to answer the “why not” question, we will end up by amassing almost all the factors, aspects and situations in China that were different from those of the West. What we do in presenting our answer, combining all these factors, may be nothing more than pointing to a different “civilizational setting,” “cultural orientation,” and “life-way” of the Chinese, to use Benjamin Nelson’s expressions.³⁵ In other words, the answer will amount to saying essentially that “China was different from the West in numerous ways, and because of these differences the Scientific Revolution did not occur in China.” Or if we push it further, it may even become: “the Scientific Revolution did not occur in China because China was different from the West.” Of course, we do not need to ask the “why not” question, and to labour on at all of these answers to reach this sort of obvious conclusion. What is important, however, is that we will have learned a lot in the course of reaching this seemingly trivial conclusion. And come to think of it, can our ultimate conclusion be really different in any essential ways from this? Is this not the function of all good, important historical questions after all?

³⁴ Sal P. Restivo has found, in Needham’s *Science and Civilisation in China* alone, some twenty-nine “factors inhibiting the emergence of modern science in China and Western Europe,” and thirty-three “factors conducive to the emergence of modern science.” See Restivo (1979), pp. 44-47 (Appendixes B and C).

³⁵ Nelson (1974), pp. 460-463. Nelson sees in the cities, universities, professions, estates, etc. of the twelfth and thirteenth centuries the “seedbed of modern European society” (p. 459), and describes the situation in the following terms:

It is ... the time when new images and horizons of conscience, self, person, society, the cosmos, action, justice, forms of rule, institutions of law and learning take on a cast that have ever since been distinctive and primary features of the Western European world. (p. 464)

6 Postscript: The “Korean Why Not Question”

I will end the paper by considering a related question concerning Korea, a question that can be called “the Korean why not question”: “Why did Korean science, which had reached the highest level in the world in the early fifteenth century, not continue to progress, but stagnate and decline instead?”³⁶ Of course, this question will have all the problems that we have found in the case of the Chinese “why not” question. But there is an additional problem that should be considered for the Korean case. In dealing with the “stagnation” and “decline” of Korean science and technology in the post-Sejong period, for example, can the historian ignore the situation in China at the time? What were the levels of the Chinese scientific ideas and techniques that Koreans of the Sejong period adopted? How did they change in China in subsequent times? If Chinese science and technology did stagnate or decline, was it possible for Korean science and technology to continue to develop independently? There are quite a few Korean scholars who seem to think so, and it is not impossible in principle for science to continue to develop, or even to flourish, in a peripheral area of a culture while it is declining at the centre. But if that is impossible, would that reduce the Korean “why not” question to being a part of the Chinese “why not” question?³⁷

References

- Bartholomew, James R. “Why Was There No Scientific Revolution in Tokugawa Japan?” *Japanese Studies in the History of Science* 15 (1976): 111-125.
- Bodde, Derk. *Chinese Thought, Society, and Science: The Intellectual and Social Background of Science and Technology in Pre-modern China*. Honolulu: University of Hawaii Press, 1991.

³⁶ Chŏn (1966), pp. 23-25; Pak (1995), pp. 159-164.

³⁷ This is really a part of the “problem of China” in the history of Korean science, one that troubles me when I try to think in general terms about the history of traditional Korean science, namely the problem of the significance of the scientific ideas and technical artefacts of China apparently omnipresent in traditional Korean science and technology. What roles and meanings should be assigned to them in the history of Korean science? Would it be permissible for a historian of Korean science to neglect them and to study only that which is uniquely Korean? In particular, what should the historian do with those ideas and techniques that were direct importations from China? In other words, how should the historian deal with those theories and practices that were exactly the same as those of China except for the fact that they were discussed and carried out in Korea? Should the history of these theories and practices become a local history of the Chinese cultural world? See Kim (1998), p. 60.

- Chŏn Sang-un 全相運. *Han'guk kwahak kisulsa* 韓國科學技術史 (History of Science and Technology in Korea). Seoul: Kwahak segyesa, 1966.
- Cohen, H. Floris. *The Scientific Revolution: A Historical Inquiry*. Chicago: University of Chicago Press, 1994.
- Cohen, Robert S. "The Problem of 19(k)." *Journal of Chinese Philosophy* 1 (1973): 103-117.
- de Bary, William Theodore. *East Asian Civilizations: A Dialogue in Five Stages*. Cambridge, MA: Harvard University Press, 1988.
- Dubs, Homer H. "The Failure of the Chinese to Produce Philosophical Systems." *T'oung Pao* 26 (1928): 96-209.
- Fung Yu-lan. "Why China Has No Science: An Interpretation of the History and Consequences of Chinese Philosophy." *The International Journal of Ethics* 32 (1922): 237-263.
- Graham, A. C. "China, Europe, and the Origins of Modern Science." In Shigeru Nakayama and Nathan Sivin (eds.), *Chinese Science: Explorations of an Ancient Tradition*. Cambridge, MA: MIT Press, 1973, pp. 45-69.
- Hart, Roger. "Beyond Science and Civilization: A Post-Needham Critique," *East Asian Science, Technology, and Medicine* 16, 1999: 88-114.
- . "Local Knowledge, Local Contexts: Mathematics in Yuan and Ming China." Forthcoming.
- Kim, Yung Sik. "Natural Knowledge in a Traditional Culture: Problems in the Study of the History of Chinese Science." *Minerva* 20 (1982): 83-104.
- . "Problems and Possibilities in the Study of the History of Korean Science." *Osiris* 13 (1998): 43-79.
- . *The Natural Philosophy of Chu Hsi (1130-1200)*. Philadelphia: American Philosophical Society, 2000a.
- . "Science and Bureaucracy in Traditional China." *The Medieval History Journal* 3 (2000b): 363-379.
- . "Some Reflections on Scientific Transmissions and Scientific Changes." Forthcoming.
- Koslow, Arnold. "More on 19(k)." *Journal of Chinese Philosophy* 2 (1975): 181-196.
- Lindberg, David C. "Conceptions of the Scientific Revolution from Bacon to Butterfield: A Preliminary Sketch." In David C. Lindberg and Robert S. Westman (eds.), *Reappraisals of the Scientific Revolution*. Cambridge:

Cambridge University Press, 1990, pp. 1-26.

Lloyd, G. E. R. *Adversaries and Authorities: Investigations into Ancient Greek and Chinese Science*. Cambridge: Cambridge University Press, 1996.

Needham, Joseph. *Science and Civilisation in China*. Vol. III: *Mathematics and the Science of the Heavens and the Earth*. Cambridge: Cambridge University Press, 1959.

———. “Poverties and Triumphs of the Chinese Scientific Tradition.” In his, *The Grand Titration: Science and Society in East and West*. London: George Allen & Unwin, 1969, pp. 11-54.

———. *Science and Civilisation in China*. Vol. V: *Chemistry and Chemical Technology*, pt. 2: *Spagyric Discovery and Invention: Magisteries of Gold and Immortality*. Cambridge: Cambridge University Press, 1974.

Nelson, Benjamin. “Sciences and Civilizations, ‘East’ and ‘West’: Joseph Needham and Max Weber.” in R. S. Cohen and M. Wartofsky (eds.), *Philosophical Foundations of Science*. Dordrecht: Reidel, 1974, pp. 445-493.

Pak Söng-nae 朴星來. “Chosön sidae kwahaksa-rül öttökke pol kösin’ga” 조선 시대 과학 科學史 를 어 떻 게 볼 것 인 가 (How Should We View the Science of the Chosön Period?). *Han’guksa simin kangjwa* 韓國史 市民講座 (The Citizens’ Forum on Korean History) 16 (1995): 145-166.

Reischauer, Edwin O., and John K. Fairbank. *East Asia: The Great Tradition*. Boston: Houghton Mifflin, 1958.

Restivo, Sal P. “Joseph Needham and the Comparative Sociology of Chinese Science and Modern Science.” In Robert A. Jones and Henrika Kuklik (eds.), *Research in Sociology of Knowledge, Science, and Art*. Vol. 2. Greenwich, Conn.: Aijai, 1979, pp. 25-51.

Sabra, A. I. “The Appropriation and Subsequent Naturalization of Greek Science in Medieval Islam: A Preliminary Statement.” *History of Science* 25 (1987): 223-243.

Shapin, Steven. *The Scientific Revolution*. Chicago: University of Chicago Press, 1996.

Sivin, Nathan. “Copernicus in China.” *Studia Copernicana* 6 (1973): 63-122.

———. “Why the Scientific Revolution Did Not Take Place in China—or Didn’t It?” *Chinese Science* 5 (1982): 45-66.