

The Positive Influence of Confucianism Upon the Development of Science and Technology—A Comment on Joseph Needham's Prejudice

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Has Confucianism exerted a positive influence or a passive one on the development of ancient science and technology? This is a question that has been debated repeatedly in the field of scientific history and philosophy and has not been settled up to now. A large number of scientific historians hold the opinion that the influence that Confucianism exerted on the development of science and technology is basically passive and negative. One of the most prominent representatives of this view is the famous historian on Chinese science and technology history—British Dr. Joseph Needham. Dr. Joseph Needham declared in the second volume of *Science and Civilization in China*, namely *History of Scientific Thought*: “They (Confucians) were thus, throughout Chinese history, in opposition to those elements which groped for a scientific approach to Nature, and for a Scientific interpretation and extension of technology”(Needham, 1956, p. 9), “their contribution to science was almost wholly negative” (p. 1). As Confucianism has been playing an important role in ancient Chinese society for a long time, it is necessary for us to discuss this issue in detail.

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I

Is the influence of Confucianism on the development of science and technology completely passive and negative? In our opinion, the facts drawn from history have tested that it is not always true. At least in the following three aspects, Confucianism played a positive and promoting role in the development of ancient science and technology.

Firstly, in terms of the four main disciplines in ancient Chinese science (astronomy, mathematics, medicine and agronomy), the traditional Confucians were not against them, instead they actively participated in and contributed to them. Confucianists had always attached great importance to observe the astronomical phenomena and compiled the calendar. From Confucian philosophy, the emperor rules the world according to the will of Heaven, and the change of the astronomical phenomena is just the embodiment of the will of Heaven. On the basis of this way of thinking, all the rulers of the past dynasties spared no effort to recruit talents to establish special astronomical observation institutions and record the changes of celestial bodies. Their goal was to maintain the lasting political stability of the dynasty. However, they objectively promoted the

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development of ancient astronomy and provided abundant and accurate astronomical observation data for astronomical research. The study of astronomical calendar cannot be separated from mathematics, which is one of the obligatory courses—the “Six Arts” (六艺) of the Confucians. Yan Zhitui (颜之推) in the Southern and Northern Dynasties once said: “Mathematics is also the most important one of the Six Arts. Since ancient times, Confucians who argued about the laws of Heaven and formulated the rhythm and calendar have all learned and mastered it.”¹ This thought is embodied in the general ideas of traditional Confucians for mathematics. Encouraged by this way of thinking, many Confucians were trying to master mathematical knowledge and learn mathematical theory while learning Confucian classics. Some of them had even made outstanding achievements in mathematics. For example, LiYe (李冶) in the Jin and Yuan Dynasties was not only a “Confucianist”, but also a famous mathematician. As far as medicine is concerned, Confucians regarded medicine as “benevolence”, and scholars should also study it. Fan Zhongyan (范仲淹), a great scholar in the Song Dynasty, once said, “If I can’t be a good minister, I will be a good doctor.”² It can be seen that Confucians attached great importance to medicine. Moreover, in the Song Dynasty, a large number of scholars with excellent medical skills appeared in the medical field. They were called “Confucian doctors” (儒医) at that time. In agronomy, Confucians had always taken agriculture as the foundation of the country and the priority of the government, which shows the Confucian’s great emphasis on agriculture. In many important Confucian books such as *The Book of Songs* (诗经), *The Rites of the Zhou Dynasty* (周礼), *The Book of Rites* (礼记) and *The Book on Elegance* (尔雅), large amount of information and knowledge about agriculture was taken down and rich agricultural achievements were accumulated. In short, in the study of the most important disciplines of ancient Chinese science and technology, Confucians had all taken an active part and had made contributions to varying degrees.

Secondly, some ways of thinking of Confucians had also performed a positive influence on the development of science and technology. In particular, these ways of thinking directed ancient scientists to widen their trains of thought and look for the correct methods when they were doing scientific researches. For example, in some ancient Chinese scientific works, we can often find what Confucius said about “drawing inferences about other cases from one instance” (举一反三) and what Mencius said about “seeking for the reason” (苟求其故). “Drawing inferences about other cases from one instance” is an important thinking method of Confucius. *The Analects of Confucius* (论语) said: “Do not enlighten a student until he has searched hard for the solution but cannot get it. Do not straighten him out until he has an irrepressible urge to express himself but cannot say it. If he is taught one instance but cannot draw inferences about other similar cases, it would be impossible to teach him any longer.”³ The significance of its methodology is to infer other things of the same kind by grasping the essence of a typical thing. Since this ideology has the universal significance of general methodology, scientists applied it into the field of scientific research as a scientific method. For example, Zhao Shuang (赵爽), a mathematician in the Three Kingdoms period, cited this sentence of Confucius when he was annotating *Zhou Bi Suan Jing* (周髀算经). Liu Hui (刘徽), another mathematician in that time, also used the method of “Drawing inferences about other cases from one instance” when studying *Jiu Zhang Suan Shu* (九章算术). He sorted out some universal arithmetic principles in the book, named “Du Shu” (都术),

¹ Yan Zhitui (颜之推): *Yan's Family Dictates* (颜氏家训). The original text is: “算术亦是六艺要事, 自古儒士论天道定律历者皆学通之。”

² The original text is: “不为良相, 当为良医。”

³ The original text is: “不愤不启, 不悱不发, 举一隅不以三隅反, 则不复也。”

which can be used to solve various mathematical problems. As for Mencius' "seeking for the reason", it is an ideal of probing and searching for the reasons and rules of things. Mencius said, "High is the sky, far are the stars, if their reasons and rules of motion were found, the time of the Winter Solstice in a thousand year could be calculated by sitting."⁴ We know that it is always the goal of astronomers to pursue the reasons and rules of the movement of celestial bodies. This sentence of Mencius has been frequently quoted by scientists of successive ages, which shows the recognition and appreciation of the thinking method of "seeking for the reason". Li Shanlan (李善兰), an astronomer and mathematician in the Qing Dynasty, once said, "Statements on astronomy, whether ancient or modern, have never been better than Mencius' 'seeking for the reason'."⁵ This is a full affirmation of the positive influence of this thinking method of Mencius in the field of astronomy. In addition to those above, some other thinking methods of Confucianism such as "learning for application", "paying attention to practice", have certain positive impact on the development of ancient science and technology.

Finally, we can find some clues about the positive influence of Confucianism on the development of science and technology from the historical characteristics of the development of science and technology and the evolution of Confucianism in ancient China. We know that in the history of ancient Chinese science and technology, there are two times that are particularly important. One is the Han Dynasty, when various disciplines began to take shape and establish systems; the other is the Song Dynasty, when traditional science reached its peak. In terms of academic thoughts in these two periods, Han Dynasty is exclusive dominated by Confucianism, while, Song Dynasty is the revival of Confucianism. Is it just a chance coincidence or some necessary connection between Confucianism and the development of science and technology in these two ages? Is it reasonable that a society's science and technology is in a highly developed and prosperous stage, while the main trend of academic thought in this period are completely negative to the development of science and technology. A society's science and technology can obtain high development must have various reasons such as political, economical, ideological and cultural reasons, etc. We have reason to believe, at least in the Han Dynasty and Song Dynasty, Confucianism is one of the ideological reasons for the development of science and technology.

In short, the influence of Confucianism on the development of science and technology is various in different scientific disciplines and different historical periods. Specific analysis should be given to it instead of negating it totally. Of course, there are some disadvantageous factors to the development of science and technology in Confucianism. It has become a common sense that imperial official selecting system after the Ming Dynasty, which took the Confucian classics as the only model, not only hindered the free argument of the ideological circles, but also the scientific research and innovation. However, in general, the impact of Confucianism on the development of science and technology is still positive. Its achievements in promoting the development of ancient science and technology are historical facts that cannot be erased.

II

Dr. Joseph Needham's prejudice against Confucianism lies in the fact that he regards part of Confucianism's negative impact in a certain historical period or in a certain scientific discipline as the whole

⁴ *Mencius-Lilouxia* (孟子离娄下). The original text is: "天之高也，星辰之远也，苟求其故，千岁之日至，可坐而致也。"

⁵ Li Shanlan (李善兰): *Tiantianxu* (谈天序). The original text is: "古今谈天者莫善于子輿氏(即孟子)'苟求其故'一语。"

effect on the development of science and technology. He had already found the right way to study this problem, that is to say, he saw two contradictory tendencies of Confucianism towards the development of science and technology: Confucianism opposed superstition with reason, which was conducive to the development of science; it cared about human but not nature, which was not benefit to the progress of science. Unfortunately, he did not follow the correct way of thinking, but rashly came to a conclusion that totally denied the positive role of Confucianism in the development of science and technology, and used it to cover the whole history of Confucianism in China. In this way, his conclusion is not only contrary to the historical facts, but also in the insurmountable logical contradictions to his own discussion in the book of *History of Scientific Thought*.

Firstly, Dr. Joseph Needham's total negation of Confucianism contradicts his discussion of Wang Chong (王充) and his skeptical tradition. Joseph Needham praised Wang Chong in the Han Dynasty as "the greatest representative" of Chinese skepticism tradition, "his (Wang's) merit in the history of Chinese science is well appreciated by modern Chinese scientists and scholars" (Needham, 1956, p. 368). But Joseph Needham also admitted that "he (Wang Chong) typifies those men who, while remaining basically Confucian, were nevertheless attracted by the Taoist interest in Nature" (Id., p. 346). That is to say, in Joseph Needham's view, although Wang Chong was influenced by Taoism, he was basically a Confucian scholar. As for the skepticism tradition after Wang Chong, Joseph Needham listed Fan Zhen (范缜) in the Southern and Northern Dynasties, Fu Yi (傅奕), Lu Cai (吕才), Liu Zongyuan (柳宗元) and Han Yu (韩愈) in the Tang Dynasty, Chu Yong (储泳), Hu Anguo (胡安国) and Shi Jie (石介) in the Song Dynasty, Liu Ji (刘基) and Xie Yingfang (谢应芳) in the Yuan Dynasty, Cao Duan (曹端) and Wang Chuanshan (王船山) in the Ming Dynasty, and put them all into the skepticism school of Confucianism. According to Needham's understanding, skepticism is the essence of the critical spirit and the necessary condition for the development of scientific thinking. Since it is so, how can we say that the role of Confucianism in science is "almost wholly negative"?

Secondly, Joseph Needham's total negation of Confucianism contradicts his evaluation of the Song Dynasty's Neo-Confucian (理学) represented by Zhu Xi (朱熹). Among Joseph Needham's thoughts, in the schools that made great contribution to the scientific thought in ancient China, only the Song Dynasty's Neo-Confucian can be compared with the Taoist thought. He spoke highly of the organic view of nature represented by Zhu Xi's thought, and thought that "there can at least be no doubt that the Neo-Confucian view of the world was one extremely congruent with that of the natural sciences" (Id., p. 493). He also regarded the brilliant achievements of Science in Song Dynasty as the inevitable result of the rise of Neo-Confucianism: "Neo-Confucian philosophy, essentially scientific in quality, was accompanied by a hitherto unparalleled flowering of all kinds of activities in the pure and applied sciences themselves" (Id., p. 495). However, Joseph Needham ignored the fact that the Song Dynasty's Neo-Confucianism was undoubted one of the well-known Confucian schools, although it combined the thoughts of Confucianism with that of Taoism and Buddhism. Zhu Xi, as the epitome of the Song Dynasty's Neo-Confucianism, is the greatest Confucian scholar except Confucius and Mencius in Chinese history. If Joseph Needham's evaluation of the scientific thought of the Song Dynasty's Neo-Confucianism can be established, it is just in contradiction with his evaluation of the whole Confucianism.

Such contradictions can also be seen in other discussions in Needham's book. For example, when discussing the Confucian classics study in the Han Dynasty, which was divided into two schools of thought: New Text School and Old Text School, Needham said: "there were scientific minds on both sides.....the Old

Text school included astronomers like Chia Khuei (賈逵) as well as mutationists like Yang Hsiung (杨雄)” (Id., p. 248). This is to affirm the contribution of Confucianism in Han Dynasty to science. When talking about the Taoist scientific thought of causality, Joseph Needham cited a paragraph from *Lu Shi Chun Qiu* (吕氏春秋): “knowing the faraway by means of the near, knowing the ancient by means of the present”⁶, which actually originated from Xunzi (荀子), a Confucian scholar. After reading Joseph Needham’s book of *History of Scientific Thought*, readers may raise a question: as the tradition of Confucian skepticism represented by Wang Chong is a necessary condition for the development of scientific thought, the Song Dynasty’s Confucianism represented by Zhu Xi contributed to the golden age of Chinese science and technology, and Confucian scholars made more or less contributions to the development of Science in many periods of Chinese history, how a totally negative conclusion can be made on the role of Confucianism in the history of scientific development?

III

Dr. Joseph Needham’s prejudice against Confucianism had historical reasons at that time and his own ideological reasons. As we know, Joseph Needham wrote the book of *History of Scientific Thought* in the early 1950s (published in 1956). At that time, the Chinese academia still basically held a comprehensive negative attitude towards Confucianism. Under such a background, it is obviously unrealistic to ask a foreign scholar not to be affected. In addition, Joseph Needham’s preference for Chinese Taoism is also a well-known fact, while Confucianism and Taoism have different views on many issues. Therefore, Dr. Joseph Needham’s radical conclusion on Confucianism should be completely understandable and not be overly critical. In any case, Dr. Joseph Needham’s pioneering work and outstanding contributions to the Chinese history of scientific thought are deeply admired and will never be forgotten.

Reference

Needham, J. (1956). *History of scientific thought*. Vol. 2 of *Science and Civilization in China*. Cambridge: Cambridge University Press.

⁶ The original text is: “以近知远，以今知古。”