Space and Time: Science and Religion in the Encounter between China and Europe

Jacques Gernet


* * *

Jean-Claude Martzloff has shown in the preceding article that what made communication between Jesuits and Chinese possible in terms of astronomical calculations was, in the first place, a common conception of time and space as measurable and quantifiable elements, and secondly, the idea that the only valid criterion in astronomical prediction was the highest degree of correspondence between calculation and observation. But this leaves open the question as to whether, given the different intellectual backgrounds of Christian Europe and China, any common theoretical ground in these two respects was not more apparent than real; in other words, whether the notions of time and space were not in fact different in China and the West. If the Chinese accepted Western mathematical techniques with enthusiasm, while rejecting whatever was theological, cosmological or logical demonstration in the Jesuits' teachings, this was probably due not simply to the practical and utilitarian approach that one usually attributes to them,¹ but to a more fundamental contradiction between

¹Although a typical seventeenth-century reaction, after the excessive quietist and subjectivist tendencies of the sixteenth century, was a renewed interest in whatever
Chinese tradition and those conceptions which constituted the basis for the development of classical science in Europe. That, at least, is the hypothesis underlying this article.

Let us begin by dealing with some of the most obvious contrasts. The Chinese, as Martzloff points out, readily accepted the different models proposed by the missionaries as practical methods of calculation, because, never having had recourse to such models themselves, they attached no intrinsic importance to the geometrical representation of the movement of the planets, and had in the course of their history repeatedly changed their methods of calculating when the results did not correspond to their observations. But, as he rightly remarks, the early Jesuit missionaries, particularly the first of them, Matteo Ricci, who died in Beijing in 1610, taught the Chinese what was generally accepted in sixteenth-century Europe as the definitive cosmology. This cosmology was inseparable from the perfect synthesis which had been formulated at the end of the Middle Ages from the biblical, Augustinian and Aristotelian traditions, and could not be questioned without casting doubt on religious dogma.

This cosmology implied, in Alexander Koyré’s words, “a structurally finite universe, hierarchically organized and qualitatively differentiated from an ontological point of view,” one that was fixed in space and time, and in which Heaven, realm of the divine and eternal, stood in stark contrast to the human world. Despite protests against the missionaries’ tactic of teaching the Chinese science in order to attract their interest—a practice first recommended by Valignano and instituted by Ricci—there was thus a certain logic in linking science and religion.  

might contribute to “the organization of the world” (jingshi), “Practical studies” (shixue) and the “broadening of knowledge” (boxue) were watchwords in seventeenth-century China.

2Thus, when, in 1760, the Jesuits finally taught them the heliocentric theory, this elicited no great reaction.

3In 1614, the Provincial for Japan and China, Valentim Carvalho, had sent Manuel Dias to visit all the existing residences and forbid “the teaching of mathematics or any other science, except that of the Gospel, to the Chinese.” See Daniello Bartoli, Dell’istoria della Compagnia di Giesù, la Cina vol. 3, no. 63 (Rome 1663, repr. Turin 1825), p. 150, quoted by Henri Bernard-Maître, “Adaptations chinoises d’ouvrages européens,” Monumenta Serica vol. 10 (1945), p. 9. Similarly in 1629, Palmeiro, the Visitor for China and Japan, became, in his turn, alarmed at seeing certain missionaries neglecting religion in favor of the sciences, and manifested his disapproval (see Bernard-Maître, “Adaptations,” pp. 10-13).
The first Chinese catechism,4 that of Michele Ruggieri, printed in 1584, supplements a simplified account of Creation with Aristotle’s astronomical theories. One find therein, for example, that “On the second day, the Lord of Heaven created nine heavens [beneath the empyrean where the saints and blessed ones live]. These heavens are wrapped one inside the other like the different layers of an onion’s skins. The ninth heaven [primum mobile, activated by God] revolves as swiftly as an arrow and completes one rotation per day. The other heavens move in their turn. The eighth is that of fixed stars, which are like pegs stuck in a plank.” It is followed by the heavens of Saturn, Jupiter, Mars, the Sun, Venus, Mercury, and the Moon. The universe, created by an almighty God, is limited in space and consists of a series of solid spheres, at the center of which lies the Earth, perfectly immobile.

According to the same catechism, “5,500 years ago there was nothing but the Lord of Heaven. Then is was that He decided to create Heaven and Earth in order to manifest His goodness.” Being a creation of God, this world is subject to a universal order: “In creating the world, the Lord of Heaven put each thing in its proper place,” continues Ruggieri’s catechism. “This is why the stars remain in the sky and don’t fall down on the earth and become mixed-up with its vegetation, and why plants don’t rise up into the sky and become mixed-up with the stars.... Knowing that fish swim, the Lord of Heaven set them in water; knowing that birds fly, He set them in the air; knowing that animals walk, He set them on the land.” Divine Providence blends with the Aristotelian notion of the “natural place,” the place to which each thing tends to return because of its nature. The number of both the living species and souls has been fixed once and for all by God—ne caret.

Nevertheless, when the first signs of the coming revision of this scholastic model began to appear in Europe, the Church, dismayed by Giordano Bruno’s daring pronouncements, became alarmed at the potential damage to the truths of the Scriptures, and, having by 1616 condemned Copernicus’s heliocentric theory, proceeded in 1633 to oblige Galileo to recant. The Bible—with its account of the Creation of the world, an immobile Earth at the center of the universe, Adam and Eve in the Garden of Eden, the Fall, the Flood, and so on—was the unique repository of the true history of Man and the Universe. Faithful as they were to its teaching, the missionaries could not afford to neglect the valuable contribution that progress in European astronomy could bring to the accuracy of their calculations. The solution, according to a practice going back to Greek times, lay in treating the new geometrical models as mere fictions, a procedure that allowed one to “preserve the phenomena” while achieving better predic-

---

4There also exists another, reworked vision of this, which should probably be assigned the relatively late date of 1648.
tions. With this one exception, there was, in China as in Europe, a perfectly consistent continuity in the Jesuits’ teaching. The only criticism that the Chinese could make, in respect to their methods of calculation and celestial geometry, was that they had contradicted themselves by retracting what they had originally presented as definitive.

The model of Christian cosmology that was still recognized and imposed as orthodox during the seventeenth and eighteenth centuries was singular: whereas the realm of God and the blessed ones is set beyond and above the celestial spheres, the eternity of God is contrasted with the age of man and the universe, which is limited by the dates of Creation and the Last Judgment to a few thousand years. This Christian model with its clear distinction between two kinds of time and space was entirely foreign to the experience of the Chinese. Their ancient conceptions, incorporating such vitally important notions as those of rise and fall that had their origin in the Book of Changes, had become fused with the Indian tradition of immensely long periods of time, the burning up of universes, and their re-creation after a period of chaos. Apart from those advocates of a thoroughgoing subjectivism, who adopted the Buddhist thesis that the world was a creation of individual minds (the position of a certain number of Neo-Confucians), the Chinese literati of the Ming and Qing accepted the idea, based on the belief in an inexhaustible supply of energy, without either beginning or end, that the universe had evolved spontaneously over an extremely long period. A contemporary of Ricci, Lü Kun (1536-1618), was but one of many, including Wang Tingxiang (1474-1544), Wu Tinghan (1490-1559), and Yang Dongming (1548-1624), who considered that the universal energy, which lay at the source of all things, was indestructible. Since the entire universe was the product of agglomeration and combinations of primordial energy in the form of yin and yang, whatever had been so formed, including Heaven and Earth, was doomed to disintegrate.\(^5\) “The universe may be destroyed (qiankun shi huide),” says Lü Kun. “That is why, when our present world comes to an end, chaos will inevitable ensue. But that whereby the universe is directed is indestructible, thus another universe will form out of the chaos. What directs the universe? The primordial energy (yuanqi) which never disappears or dimin-

\(^5\) It is possible that this notion, first clearly expressed by Zhang Zai (1020-1077), has its origin in the Buddhist conception of aggregation (skandha), sometimes translated as ju (gathering), which is precisely the term used by Zhang Zai, along with its opposite, san (dispersion), which designates the dissolving of all things and their return to the Great Void (taixu). See Zhengmeng, Taihe pian, passim.
ishes throughout the course of billions of years. It is the ancestor of all transformations.\(^6\)

Along with cosmic catastrophes and the spontaneous re-creation of universes, the notion of immensely long periods of time was also widely accepted by those Chinese to whom the missionaries were proclaiming their belief in the brevity of a world created by an almighty God. As Martzloff remarks, the mathematical astronomer Wang Xishan (1628-1682) was accustomed to dealing with periods of time covering billions of years, and, as we have seen, Lü Kun held that primordial energy had neither increased nor diminished throughout a similar expanse of time.\(^7\) Criticism of the missionaries' teaching concerning Heaven and Earth may thus be partially explained as a rejection of the extremely low limits they imposed on time and space.

Whereas the first European efforts to free cosmology from its biblical tradition date from the beginning of the seventeenth century, it was not until the eighteenth century that the same thing was attempted for the physical history of the Earth. In 1749 Buffon had found himself obliged to withdraw his estimate of the age of the Earth because his calculation of time needed for it to cool down produced a figure of 74,832 years. Moreover, when, in 1778, he published his *Epoques de la nature*, he devoted ten pages at the beginning of his book to explaining that his ideas were compatible with Moses, to prevent its being condemned to the papal Index. As one could not question the validity of the Bible, the most important problem at that time was still how to make secular historical facts coincide with events in the Scriptures. Consequently, the dates assigned by Chinese history to the Flood during the reign of Yao, as well as to the first civilizing rulers—all earlier than anything that could be deduced from either of the two versions of the Bible—caused considerable embarrassment.

---

\(^6\) *Sheninyu quanji* 4.1.8b. Concerning the spontaneous evolution of the universe, one might, for example, quote another passage from the work of Lü Kun (*Sheninyu quanji* 4.1.16a-b) in which he tries to provide a concrete representation of the different stages in the formation and destruction of the universe by means of a pool filled with sand, stones, tiles, water and seeds. In his *Qianshu*, written circa 1700 (Beijing: Zhonghua shuju, 1955, repr. 1963 and 1984, 2, 29, *Boguan*), Tang Zhen (1630-1704) also takes up the theme of inexhaustible energy as the origin of the world, and compares the reproduction of identical universes to that of animal and vegetable species.

\(^7\) Another, more specifically Buddhist, notion is that of an infinite number of universes in limitless space. The hypothesis of a plurality of worlds, which one finds among several Greek and Latin authors, and even certain thinkers during the Middle Ages, reappears in the West with Giordano Bruno, who was burned at the stake in Rome in 1600, and again, at the end the seventeenth century, as a result of growing doubts concerning the biblical account of Creation. Fontenelle's *Entretiens sur la pluralité des mondes* appeared in 1686.
both in Europe and among Jesuit missionaries. While, in Europe, the presence of fossils in mountainous regions had long been explained by the Flood, the Chinese had accepted the possibility that there had been important climatic changes and geographical upheavals in ancient times. Shen Gua (1031-1095), for example, in commenting on some bamboo fossils discovered around 1080 at Yan’an in northern Shaanxi, wrote: “It must be that in very ancient times the level of the Earth being lower, and the atmosphere damper, this region was suitable for bamboo.”

According to the theology of St. Augustine, which was still that of Bossuet in the seventeenth century, “the past was not natural either in terms of its framework or its substance: it was Sin. Historical time was linked to Sin. Sin was the driving force of history. Human history had a meaning. But its meaning only emerged when one considered it from the point of view of God’s will, History was ... a trial designed by God for mankind.” St. Augustine had influenced Christian historians right up into the nineteenth and twentieth centuries, including even rational historical philosophers such as Condorcet and Hegel. Human history only achieved its independence in Europe in the eighteenth century, but in China it freed itself much earlier from the theory of the five phases (wuxing) that was in fashion in Han times. In the seventeenth century, Wang Fuzhi (1619-1692) is thoroughly aware of the extraordinary evolution that had taken place in China since the second millennium B.C., when the country, still in part primitive and uncivilized, consisted of a large number of small states each with its own independent ruler. Like Wang Tingxiang, Wang Fuzhi warns against anachronisms: one must beware of seeing the past in terms of the present. Wang Fuzhi’s well-known statement that “the leaders of the ancient states were like today’s aboriginal tribal chiefs” is to be found in Liu Xianting’s (1644-1695) Guangyang zaji. Liu adds: “Scholars have long misunderstood history, attributing to the ancients the feelings of Han, Tang and Song men, with the result that the more they say, the more they depart from reality.” In Europe, Leopold von Ranke (1795-1886) was the first to express the same idea. Although it would be an error to present Wang as some kind of precursor of modern scholars of pre-history, he was aware that the beginnings of civilization had been proceeded by long periods which have left no trace, because man had

---

8The importance of the problem is demonstrated by the voluminous correspondence devoted to it by Father Antoine Gaubil who was in Beijing between 1722 and 1759. See Correspondance de Pékin, 1722-1759, Renée Simon, ed. (Geneva: Droz, 1970).


as yet no means of writing and was still close to the beasts. Wang believed that civilized man might well fall once more into a state of barbarism and from barbarism into savagery, and he even considered it possible that man might one day revert to the state of an animal. For Wang, it is all a question not only of time, but also of place: wild man, primitive man, barbaric man and civilized man may have coexisted in the course of history.\textsuperscript{11} In fact, Wang Fu\=zhi conceives of the human world, like the universe, as the scene of continuous creation and destruction: “The transformations of the universe,” he writes, “are perpetually renewed (tiandi zhi hua ri xin).” For him, periods of varying duration and endless processes of transformation are characteristic of all universal phenomena. It is by no means a question of alternation and cycles of time, but of a multiplicity of concomitantly evolving processes and of variable lengths of time.

Galileo had first advanced the hypothesis of a single, all-embracing physics whose laws would be equally applicable to the Earth and the celestial world, but, in the West, it was not until the nineteenth century that there emerged the idea that man and the animals belong to the same natural order. The well-known Chinese doctrine, formulated in the eleventh century, which held that “Heaven and Earth and the ten thousand things all form one body” (tiandi wanwu yiti)\textsuperscript{12} was singled out for condemnation by Ricci in his Tianzhu shiyi, as was the Chinese belief that there was no inherent difference between man and the animals. In Europe, it was Darwin’s theory of the evolution of species that first cast doubt on such a radical opposition.\textsuperscript{13}

\textsuperscript{11}See the last two paragraphs of the Siwenlu waipian.
\textsuperscript{12}Henan Chengshi cuyian in Er Cheng quanshu (Sibu beiyao ed.) 1.7b.
\textsuperscript{13}There is, it should be noted, still fierce resistance to Darwin's theories among fundamentalist Christians, who reject the separation of science from religion that occurred in the seventeenth and eighteenth centuries. The debate between Darwinism and a literal reading of Genesis, which came to a head in an American lawsuit in 1925, is still far from being resolved in the United States. According to the Christian defenders of the biblical account of the creation of Adam and Eve, it is (a) disgusting to teach that human beings, created in the image of God, are descended from such an inferior species as the apes, and (b) undemocratic to impose on school children instruction which violates the religious conscience of their parents. See Dominique Lecourt, \textit{L’Amérique entre la Bible et Darwin} (Presses Universitaires de France, 1992), who notes that “the advocates of ‘scientific creationism’ ... profess to be able to prove that the Earth is less than 10,000 years old.” Even in today’s Vatican one finds a similar tendency to cast doubt on the findings of science concerning the history of mankind: the \textit{New Universal Catechism} declares “our knowledge about the age and origin of the human race is still somewhat fragmentary and hypothetical.”
Divine eternity exists, by definition, outside of human time and space. Sharing in none of their limitations, it also excludes any notion of transformation. Whereas the tangible world is ephemeral and subject to decay, divine truths are eternal. Prior to the seventeenth century, Christian Europe put one science above all others: the science of the Holy Scriptures. Even if missionaries presented their various geometrical models as mere provisional fictions for calculation purposes, they could not question the belief that divine laws, eternal and unchanging, ruled the universe, and it was on the basis of this commonly shared conviction that classical science was built in Europe. No such notion existed in China.

Martzloff's summary of a statement by Qian Daxin (1728-1804) shows that Chinese ideas were incompatible with those that served as the foundation of that classical science in Europe: "European astronomical theories claim to be able to rediscover through calculation the past positions and duration of certain ancient celestial phenomena: no such thing is possible, because the current astronomical theories for prediction are based on data that are only valid at the present time." One can well understand what Fang Yizhi (1611-1671) meant when he declared that "the Westerners were skilful at measuring things (zhice), but weak in their understanding of subtleties (tongji),"¹⁴ the term ji being applied to the infinitely subtle changes which, by their cumulative effect, bring about major transformations. One is reminded of the oft-quoted expression from the preface to the Shi ji: "An infinitesimal [initial] error eventually leads to a 1,000 li-discrepancy" (shi zhi haoli cha yiqian li).

To conclude, it is clear that we are confronted with two quite different conceptions of time and space, and that these conceptions belong to two distinct intellectual traditions whose history may be traced. In Europe, following the synthesis of the Christian and Aristotelian traditions, one finds a theoretical distinction between the perceptible and the intelligible, a belief in the existence beyond phenomena of eternal realities that only the reasonable soul is capable of grasping, an absolute faith in geometrical deductions, and the belief in God as the Creator and ruler of the universe—all convictions that made it possible to search for perfect and immutable laws that governed the universe, independent of time and space. In China, on the other hand, given a mentality that was more practical than speculative, the philosophical importance of the Book of Changes and Indian influences, one finds the idea that the universe is fundamentally unstable, spontaneously evolving and without any fixed limits—in short, the idea that both time and space are relative. Such conceptions were still prevalent in

nineteenth-century China as is demonstrated by a text in which Wei Yuan (1794-1857) reviews the profound transformations that had taken place in the world and in the universe since high antiquity: stars mentioned in ancient astronomical works, but no longer visible, new stars unknown in ancient times, the change in the tropical year, geographical modifications, transformations among men and their customs, and in cultivated plants and political institutions.¹⁵ The Chinese, who were unaware of the Western conception of substance, conceived of the universe as the product of varying combinations of primordial energy, the yin and the yang. They held that the amalgamation and interaction of these primordial forces accounted for the formation not only of the universe, but of all life. As Wang Fuzhi expressed it, "Without a sprout, there will be no bud, without a bud, no flower, without a flower, no fruit, without fruit, no sprout. But if we investigate further [into the sequence of growth], then, if the yin and the yang did not determine the combinations, there would be neither root, nor stem, and if the yang did not stimulate and the yin failed to respond, there would be neither calyx nor ovaries."¹⁶ Thus, yin and yang explain not only the formation and development of living things, but their reproduction as well. Science, on the contrary, founded as it was on the basis of such Western notions as substance and absolute truths, valid everywhere and for all time, has developed through a series of ruptures and critical reappraisals of theoretical models previously regarded as definitive. Hence, the search for new models, considered, in their turn, as definitive.

In Europe, classical science aimed at discovering eternal truths, independent of time and space, those same truths that had operated at the Creation of the world. Now, the idea that such truths could exist was incompatible with the Chinese conception of the relativity of time and space and of a universe in perpetual and inevitable transformation. In Christian thinking, divine eternity was contrasted with the history of the world and mankind, history being confined to the period between Creation and the Last Judgment. In Europe, the successive victories of science were only rendered possible by a separation of secular science from biblical truth. Such milestones as (a) the acceptance of the idea of a unique physics, valid for the entire universe; (b) the discovery that the universe was the product of very long periods of evolution; (c) the establishment of a history of mankind free from any theological perspective; (d) the rejection of the radical distinction that Christianity drew between man and the rest of Creation, were no more than a series of open doors that needed no pushing in the eyes of seventeenth- and eighteenth-century Chinese. What strikes us as

---

¹⁶Chuanshan yishu quanji, Zhouyi waizhuan (Taipei: Ziyou chubanshe, 1972), 2.866.
modern in Chinese thought is precisely the close link between its freedom from strict dogma and the commonly held idea that the whole universe is constantly changing, and that, as a result, one can only reach provisional and relative conclusions: any statement is valid only for a particular time and particular place. But this thought lacked the motives and the peculiar intellectual framework which led to the development of classical science in Europe. When contrasted with Chinese conceptions and realities, one sees more clearly how European beliefs and traditions, despite—and thanks to—theological dogmas, favored the discovery of universal laws and progress in scientific thought.

GLOSSARY

Boguan 博觀
boxue 博學
Chuanshan yishu quanji 船山遺書全集
Fang Yizhi 方以智
Guangyang zaji 廣陽雜記
Er Cheng quanshu, Henan Chengshi cuiyan 二程全書河南程氏粹言
ji 構
jingshi 經世
ju san 聚散
Liu Xianting 劉獻廷
Lü Kun 呂坤
Mengqi bitan 梦溪筆談
Qian Daxin 錢大昕
qiankun shi huide 乾坤是毁灭
Qianshu 潛書
Shen Gua 沈括
Sheninyu quanji 明呂坤呻吟語全集
sh i zhi haoli, cha yiqian li 失之毫厘差之千里
shixue 實學
suo yi zhuzai qiankun 所以主宰乾坤
taxu 太虚
Tang Zhen 唐甄
tiandi wanwu yiti 天地萬物一體

tiandi zhi hua ri xin 天地之化日新
Tianzhu shengjiao shilu 天主聖教實錄
Tianzhu shiyi 天主實義
tongji 通幾
Wang Fuzhi 王夫之
Wang Tingxiang 王廷相
Wang Xishan 王錫闆
Wei Yuan 魏源
Wei Yuan ji 魏源集
Wu Tinghan 吳廷翰
Yan'an 延安
Yang Dongming 楊東明
yinyang 隱陽
yuanchi 元氣
zaohua suocheng... 造化所成無一物相肖者
Zhang Zai 張載
Zhengmeng, Taihe pian 正蒙太和篇
zhice 質測