A JAPANESE REACTION TO ARISTOTELIAN COSMOLOGY

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The British historian Charles Boxer once called the years 1549-1650 "the Christian century" in Japan.[1] The Christian influence has tended to be underestimated because of the successive persecutions and executions against Christians by the authorities towards the end of the sixteenth century and around the beginning of the following century, as well as the *sakoku* policy which was introduced in 1630s. It is true that the paucity of written documents on the part of Japanese authors gives us tremendous difficulty in trying to trace historical facts for this period. However, there remain a few sources which tell us what was brought in by the missionaries.

Having noticed the inquisitive and rational mind of the Japanese, Francisco Xavier (1506-52) and Alessandro Valignano (1538-1606), Visitor to Japan and China, both of whom had laid the foundation for missionary activities in Japan, adopted a policy of teaching them first the order and beauty of the natural world and then inviting them to recognize the existence of God behind it. Valignano also found it necessary to teach Japanese Christians the subjects in the humanities and his idea led to the establishment of the college (Colegio de Sao Paulo) in Funai in 1580. It started with a group of seven or eight young foreigners who were taught Latin grammar and the basics of the Japanese language and humanities studies. They completed these studies in 1583 and moved on to the full course in philosophy. When Pedro Gomez (1533-1600), a Spanish Jesuit, reached Japan in 1583, one of his most urgent tasks was the organization of studies at the Funai college. Gomez was asked to write a textbook for the college

[1] C.Boxer, *The Christian Century in Japan (1549-1650)* (Berkeley/Los Angeles: University of California Press, 1951)

students on account of his previous experience of teaching at the Jesuit College in Coimbra. Sometime between August and October in 1593, his long-awaited textbook was completed. By 1593, more than forty students, Europeans as well as Japanese, are said to have been studying at the college. Since Japanese students knew no Latin, Pedro Ramon (1550-1611), another Spanish Jesuit, translated the textbook into Japanese probably by the beginning of 1595. This textbook, usually called *Compendium* which is the title of the third part: *Compendium catholicae veritas...*, consists of three parts:

(1) *de sphaera* in which Aristotelian cosmology and meteorology are discussed,

(2) *de anima* in which Aristotelian philosophy on soul is explained, and

(3) the theological parts in which Christian faith and post-Tridentine Roman Catholic theology are treated.

Thus, Gomez's trilogy became the standard textbook for Japan. It is the first part of his trilogy, *de sphaera*, that played a significant role in the introduction of Aristotelian cosmology into Japan.[2]

1. Sawano Chuan and the *Kenkon Bensetsu*

Christovao Ferreira (1580-1650) from Lisboa had been engaged in missionary activities in the Kyushu area since the early 1610s before he was caught in Nagasaki in 1633. Unable to endure the torture of his captors, he became an apostate and naturalized, taking up a new name Sawano Chuan. He was ordered by Inoue Masashige, Inspector General against the Pagans, to translate into Japanese a Western astronomy book, which was confiscated from a Christian father caught in 1643. Chuan (Ferreira) wrote the text of translation in Roman alphabets, because he could not freely write in Japanese scripts, though he was well versed in Japanese. A certain interpreter named Nishi Kichibei converted the text of Roman alphabets into Japanese *kana* and *kanji*. Then, Mukai Gensho (1609-77), a Confucian scholar, made

[2] For the transcription and new Japanese translation of Gomez's text of *de sphaera*, as well as the introduction to the background of Gomez and his treatise on the sphere, see Obara Satoru, "Kirishitan jidai no kagaku shiso" (Scientific thought in Christian century), in *Kirishitan Kenkyu*, vol.10, (1965).

critical comments on the Western cosmological ideakanj put forward by Chuan. This is how *Kenkon Bensetsu* (Discussions on the Heavens and the Earth with Critical Comments, preface 1650) came into being.[3] The Western book on astronomy mentioned above which Chuan is said to have translated has not yet been identified. But the textual comparison reveals that Gomez's *de sphaera* is certainly one of the main sources for his translation. However, some of the illustrations in the *Kenkon Bensetsu* can not be found in Gomez's textbook, but can be seen in Christopher Clavius' commentary on Sacrobosco's *de sphaera* (1607). Clavius' commentary deals only with the heavenly world and not with four elements and meteorological phenomena in the sublunary world which the *Kenkon Bensetsu* discusses. This fact reveals that Chuan consulted more than a couple of Western astronomy books, and the sources for his translation seem to be not so simple as told in Mukai's preface.

2. Comparison of the Characteristics of Learning among Four Countries

Mukai Gensho writes a short treatise at the beginning and before the start of Chuan's texts in order to compare the characteristics of learning among four countries: Japan, China, India and the West. He first notes that Japan, whose small islands are scattered around in remote places, is able to be called a great country because of people's wit, virtue, and high morality. Then he divides the four countries into the two groups: Japan-China and India-the Southern Barbarians (the West). Its demarcation principles are the following two:

(1) writing system; vertical or horizontal and

(2) eating style, using chopsticks or eating directly with the hands.

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[3] This is based on the preface by Mukai Gensho. However, his preface is dated wrongly, and doubts have been cast on its authenticity. Chuan's preface is dated in 1650. One of the different versions *Nanban Unkiron*, has a note that the hand-written copy was acquired in Kyushu during the Shimabara campaign (1637-8). If it is true, the *Kenkon Bensetsu* must have been completed by this time. However, this is contradictory to the passage in Mukai's preface, where he says that Chuan died without giving any title although his text had already been completed. Mukai's remark suggests that the *Kenkon Bensetsu* was completed not long before Chuan's death in 1650. Although the date of completion is yet to be decided, I think that the actual process of how Ferreira, Nishi, and Mukai were involved is not so different from what has been told in the preface. See Preface, *Kenkon Bensetsu,* newly printed in *Bunmei Genryu* Sosho, vol. 2 (Kokusho Kankokai, 1914), pp. 1-2.

The countries of the first category, users of vertical writing and chopsticks, to which Japan and China belong, adopt the concepts of *li-qi, yin-yang*, and five elements as the main principles of their learning, while the countries of the second category, horizontal writers and users of hands in eating, to which India and the Western countries belong, do not know the theories of *li-qi*, and *yin-yang*, and believe in the four-element theory, casting doubt about the concept of five elements. The learning of the Southern Barbarians are well versed in the theories which concern figures[4] and instruments[5] and do not have deep knowledge about things which go beyond figures (i.e. metaphysical meanings). The countries in the first category are, in his opinion, obviously superior to those in the second category. Both in Japan and China, Confucianism is believed and their learning is based on the theories of *li-qi*, and *yin-yang*. However, Mukai argues, the basis of Japanese learning is Shintoism. Without it, even Confucianism will degenerate into the learning which seeks only for utility. Students of Shintoism who are not well versed in Confucianism shall fall into heresy and witchcraft. Therefore, to master both Shintoism and Confucianism is the best way for learning.[6] In Mukai's opinion, Japan, thus, comes first, with China coming after her in the standard of learning.[7]

3. Aristotelian Four Elements vs. Confucian Five Elements

The *Kenkon Bensetsu* consists of four parts, two on the heavenly world (*ken*) and two on the sublunary world (*kon*), following Aristotelian dichotomy between them. In contrast to the order of Gomez's text of the *de*

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[4] *Katachi* or *kei* in the original text is translated as "figure" throughout this paper, because I am afraid that "form" may be misconceived as something to do with Aristotelean *forma*.

[5] Though translated as "instrument", *ki* in *keiki* in the original text comes from the usage contrasted to *Tao* in the *Book of Change*, where Tao is posited at metaphysical level, while *ki* is at the physical level. Therefore, Mukai's intention here is to point out that learning in India and the West is good at the physical level, but not at the metaphysical level.

[6] *Kenkon Bensetsu,* pp. 6-8.

[7] For a general discussion on the *Kenkon Bensetsu* in English, see Nakayama Shigeru, *A History of Japanese Astronomy* (Cambridge, Mass.: Harvard University Press, 1969), pp.88-98, and Mikami Yoshio, "On an astronomical treatise ("*Kenkon Bensetsu*") composed (in 1650) by Portuguese in Japan", *Nieuw Archief voor Wiskunde*, vol. 10 (1913), 61 ff.

sphaera, the *Kenkon Bensetsu* starts with discussions on the sublunary world, where the first seven chapters are devoted to the introduction of the concept of four elements. In his commentaries on the text of the *Kenkon Bensetsu* prepared by Ferreira, Mukai criticizes Western ideas mostly from the viewpoint of Confucian *yin-yang* and five-element theories. One of its typical examples is the confrontation between Aristotelian concepts of the four elements and Confucian theory of the five elements.

Chuan's first criticism is targeted at the idea that myriad things are made out of the combination of the four elements. Following Aristotelian dichotomy, the heavens have nothing to do with the generation and degeneration of matter in the sublunary world. Mukai's dissatisfaction with the four elements lies precisely on this point. It is told, he points out, in the very beginning that the light of the sun, the moon and stars illuminate the world and nurture myriad things on the earth, raising them by showering virtue all over them. In the beginning of the part on the celestial world, it is said that myriad things on the earth are generated out of a combination of the four elements, but there is nothing which generates without receiving the vital *qi* from the Heavens. Therefore, he argues that the scholar of the Southern Barbarians is contradictory in his discussion. Mukai does not seem to be able to comprehend Aristotelian dichotomy to its full extent, for he counts the heavens as one element of the traditional five-element doctrine, saying that

> "[...] *since the five elements are supplied by the function of* yin-yang, *which is obvious as we see things right in front of us, the barbarian scholar cannot conceal one element. Therefore, he discusses the heavens in addition to the four elements.* [...] *Is it true that the heavens plus the four elements make the five elements? Is it not the case that the combination of the five elements generates myriad things?*" [8]

Chuan (Ferreira) attempted to explain the four-element theory in terms of the five-element principle by employing the concepts of production (*sosho*) and overcoming (*sokoku*). For instance, he explains, since "dry" in fire and the one in earth are of the same *qi*, fire "produces" earth, although "warm" in fire and "cold" in earth are contradictory to each other. But, "dry" in earth and "humid" in water are of different *qi* so that earth overcomes water.

[8] *Kenkon Bensetsu*, p. 54.

Such misuse of Chuan as to the concept of production and overcoming is severely criticized:

> *"The concept of production and overcoming is beyond the comprehension of the students of the South Barbarians".*

Being the head of the Confucian school in Nagasaki, Mukai could not tolerate Chuan's application of his superficial knowledge of Chinese philosophy. His conclusion is: the reason why they argue like this is they do not know the theory in its true sense.[9]

After Chuan's discussion on the Aristotelian concept of the natural place of four elements where earth holds the lowest place, Mukai argues in his refutation that when we place water on the earth, water easily goes down and submerges in the earth, while when we place earth on water, earth will be sunk into water. Therefore, he concludes, the truth is that earth and water hold the same place, both being mingled together and not be able to be separated.[10] Mukai here is no doubt confused about elements as a theoretical concept with earth and water in the real world.

4. The Sphericity of the Earth

Strongly influenced by the Chinese traditional idea (*gai tien* theory) of the "round heaven and square earth" and by the Sumer cosmology of Buddhism, the Japanese had adopted the theory of the flat earth. The idea of the sphericity of the earth was brought by Catholic missionaries in the "Christian century". For instance, Luis Frois (1532-97) reports that Oda Nobunaga (1534-82) had a terrestrial globe at his side which had been presented by them. A famous debate took place between a Confucian scholar and a Japanese Christian in Kyoto in 1606. One of the subjects over which they disagreed was the shape of the earth. Hayashi Razan (1583-1657) who was to become the founder of the *bakufu* school for Confucianism wrote a short essay about this debate under the title of the *Hai Yaso* (Rejecting the Christians)[11]. The man who vindicated Christian ideas was called Fukan Fabian (1565-1621?), a man of strange fate, who joined in the Society of Jesus in 1586 and wrote the book *Myotei Mondo* (Dialogue between Two

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[9] *Kenkon Bensetsu*, pp. 9-16.

[10] *Kenkon Bensetsu*, pp. 20-23.

[11] The text for the *Hai Yaso* can be found in *Nihon Shiso Taikei* vol. 25 (Kirishitan sho, Haiya sho [Christian and anti-Christian books]) (Iwanami Shoten: 1970).

Nuns) in which he explained Christian concepts, but became an apostate soon after the debate and attacked Christianity, in turn, in the book *Ha-Daiusu* (Refuting Deus).

Razan was first shown by the picture of Jesus and the map of the spherical earth. They started the discussion on the concept of the direction "up" and "down". According to the theory of the flat earth, the direction "up" always refers to the direction over our heads while "down" to the direction beneath our feet, wherever we are. However, in the theory of the spherical earth, the direction beneath one's feet ("down") points to the direction over the heads ("up") for the man situated at the opposite side of the round earth. The treads of the two men who stand precisely at the opposite side of the earth face towards each other with the earth between them. This phenomenon was incomprehensible and the whole discussion was ridiculous for Razan. Shown optical instruments like prisms, he made a comment that the Christians devised curious instruments by which to allow the innocent populace go astray. At one point, Razan asked Fabian the question "who created the Creator, then?" After a series of exchanges of their views, Razan concluded: Christians claimed that both the heavens and the earth were round, whereas, in his judgement, there were motion and rest, and things were round and square; everything was in accordance with these principles; and thus, the heavens and the earth were not the exceptions. Following the traditional Chinese concept, Razan drew the principle: those that move are round, those that rest are square. This obviously shows that the square and flat earth rests while the round heaven moves.

Given this situation, Mukai's comments on the sphericity of the earth in chapter 8 of the *Kenkon Bensetsu* is quite remarkable. It was probably the first time that this idea was explicitly recognized and approved. Chuan enumerates various pieces of evidence for the sphericity of the earth:

(1) the time for dawn and sunset is different according to the location along the longitude (the sun would rise and set at the same time everywhere if we adopt the theory of the flat earth);

(2) when we are leaving the land on a ship, we can see a port and seashore while we are not so far from the land, but can not see them from far away;

(3) when we are approaching the land, we first see the tops of mountains and are only gradually able to observe the lower parts.

The cases (2) and (3), Chuan argues, can happen because of the curvature of the earth.

(4) At the time of the Great Discovery, the Spanish set sail westwards, while the Portuguese went eastwards, and they often encountered each other somewhere near China or Japan. (If the earth is flat, this will never happen. Two ships sailing in opposite directions will never meet.)

(5) The shape of the shadow (of the earth) at the time of lunar eclipse is round.

Although he affirms the sphericity of the earth, the tone of Mukai's comments sounds apologetic. Pointing out that the Confucians already noted the idea by an analogy that the heavens and the earth were spherical like the shell and yolk of an egg or a bullet, he argues that the Confucians do not claim that the earth is square in shape, when they talk of the idea of "round heavens, square earth", but that "square" in this phrase simply refers to the four cardinal points. He admits that "although the theories proposed by the Southern Barbarians are not erroneous, quoting clear examples and evidences, their discussions remain merely on the level of figures and bodies, and are moreover tedious". Since those who are well versed in the *yin-yang* theory and the principles of the heavens and the earth, will easily understand the principle (of the sphericity of the earth) without listening to the evidences brought up by the barbarians, and the idea of the sphericity of the earth was already discussed in the *hun tien* theory (the analogy of egg's yolk above), the idea that the heavens and the earth are spherical should be learned in Confucian teachings.[12]

5. Physical vs. Metaphysical

In sharp contrast to the first two parts which deal with the sublunary world, the latter two parts of the *Kenkon Bensetsu* on the subject of the heavenly world receive less severe criticisms from Mukai. His general comments are made in such a mild tone as "we do not find any errors,"[13] or "no objection".[14] He goes as far as to say with such praise as "the least erroneous. Very good arguments" or "the idea of the barbarians is supreme".[15]

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[12] *Kenkon Bensetsu*, pp. 25-29. The idea of the "square" earth was often defended by the argument that it did not refer to the shape but to the "virtue" (*toku*). See, for instance, *Nigi Ryakusetsu,* part 2, chapter "the area for the element earth is spherical" in *Nihon Shiso Taikei* vol. 63 (Iwanami Shoten, 1971), p. 98.

[13] *Kenkon Bensetsu*, pp. 58, 70, 71, 74, 84, 87, 92, and 96.

[14] *Kenkon Bensetsu*, pp. 74 and 77.

[15] *Kenkon Bensetsu*, pp. 64 and 85, respectively.

However, throughout the whole book we repeatedly encounter his remarks that the barbarians do not know the principle of *li-qi*, or that of *yin-yang*. As we noted above (Section 2), the criteria for his evaluation of the learning in the four countries are exactly this *li-qi* and *yin-yang* theories.

However, we should note that Mukai recognizes Western superiority at the level of figures and instruments *(keiki)*, i.e. in physical matters. Let us quote a typical argument of his:

> *(after a brief explanation of Aristotelian four-element theory) "[...] thereby they have doubts about the theory of five elements and do not know the theory of* yin-yang. *They are good only in elaboration on the level of figures and instruments (*keiki*) and therefore ignorant of metaphysical (*keijijo*) meanings. Although they doubt, they do not dare to discuss (metaphysical meanings). Their discussions are detailed only on the subjects regarding figures (*katachi*). Therefore, they are not good in insights about the past, present and future, and easily go astray in such a nonsense as paradise and hell. They do not know the principles of* li-qi *and* yin-yang *even when they talk about the subjects over figures and thus fall into banal as well as vulgar discussions".* [16]

The terms *keijijo* (metaphysics) or *ki* (instruments) in *keiki* appear in the *Book of Change*, where *ki* is contrasted to Tao. Therefore, we can interpret the words like figures (*katachi*) or instruments as something physical. What Mukai intended to say in the above quotation is that the Westerners are good at physical investigations whereas they are virtually ignorant of metaphysical discussions. Needless to say, by metaphysical discussions he meant those which were argued on the basis of the principles of *li-qi* and *yin-yang*. He repeats in his comments that "they do not know *yin-yang*" or "they are not versed in the theory of five elements".[17] Moreover, Mukai notes that when the barbarians elaborate their discussions merely on the level of figures,[18] they appeal to examples and evidences,[19] which appears tedious. Mukai seems to have been impressed by the Western way of argument, but this, in turn, led him to believe that the Westerners were good only at superficial (physical) discussions and not at metaphysical arguments.

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[16] *Kenkon Bensetsu*, p. 6.
[17] *Kenkon Bensetsu*, pp. 10, 16, 18, 20, 23, 29, 39, 45, 48, 54, 63, and 97.
[18] *Kenkon Bensetsu*, pp. 16, 29, 39, and 61.
[19] *Kenkon Bensetsu*, pp. 38, 58, and 85.

Mukai was the first who explicitly admits to Western superiority at the physical level, and his observation discussed above is the first instance of Japanese recognition: the Westerners are good at a physical level, but ignorant of discussions at a metaphysical level. We know that Arai Hakuseki (1657-1725), a Confucian scholar and advisor to the sixth shogun, had a similar impression on the investigation of the captured missionary Giovanni Battista Sidotti (1668-1714). And, of course, the idea culminated in Sakuma Shozan's (1811-64) famous dictum: "Eastern Morality, Western Science and Technology". This idea facilitated the Japanese in justifying the introduction of Western science and technology which are considered to be superior, while they could maintain their identification at a metaphysical level at the same time.

6. Other Manuscripts

It is extremely difficult for us to estimate how widely the *Kenkon Bensetsu* had been circulated, because we find only three sets of its copies extant.[20] A few words should be mentioned about the *Nigi Ryakusetsu*[21] (A Brief Discussion on the Two Worlds, [Celestial and Terrestrial]) which deals with the same subjects. The author Kobayashi Kentei (1601-83) is said to have been imprisoned for twenty-one years because his teacher was suspected of being a Christian. He was set free in 1667 when he was sixty-seven years old. Therefore, the book under discussion must have been written between 1667 and 1683, although the only extant manuscript says that copying was completed in the autumn of 1715. The *Nigi Ryakusetsu* follows more closely the texts of Gomez's *de sphaera* than the *Kenkon Bensetsu*. The order of chapters is more or less the same: the parts on the celestial world come first, and then the parts on the sublunary world follow, which is a quite opposite order in the case of the *Kenkon Bensetsu*.

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[20] Before World War II, three more sets of copies existed.

[21] The manuscript is preserved in the Cabinet Library (Naikaku Bunko) of the National Archive, Tokyo. The text is available in a recent print: *Nihon Shiso Taikei*, vol. 63 (Kinsei Kagaku Shiso, ge [Scientific Thought in Edo Japan, the second part] (Iwanami Shoten, 1971), pp. 10-107. See also Obara Satoru, "Yoroppa kagaku shiso no denrai to juyo [The arrival and acceptance of European scientific thought]", *ibid.*, pp. 481-496. For a brief discussion about the book, see Nakayama, *A History of Japanese Astronomy*, pp. 98-100. The man who copied this work named Ohe notes that the manuscript he referred is the autograph of Kobayashi. But this does not seem to be the case, for the order of chapters are somewhat confused. For example, the chapters for four elements are inserted in the part for the celestial world in this extant copy, although the editors correct this in a recent print.

Probably Kobayashi based his renderings on the Japanese translation of Gomez's treatise on the sphere.

There remain similar extant manuscript texts which seem to be different versions of the *Kenkon Bensetsu*. This suggests that different versions were made to meet the needs of the readers, but hand-written copies were perhaps intentionally destroyed, fearing that the mere possession of the work written by an ex-Christian father might bring about severe punishment.

There are four titles which have their own characteristics.

(1) *Nanban Unkiron* (A dicussion by the Southern Barbarians on the *yun qi*)[22] (preserved by the Ohkochi family; its new hand-written copy is available in the Japan Academy).

According to the note written by a certain man Sugi Teian in 1670, this was copied from the manuscript possessed by Matsudaira Terutsuna, who went to fight in the battle against the Christian uprising in Shimabara (1637-8). This experience led him to take an interest in the art of war and eventually to write a book on firearms and how to enter into battle for foot soldiers. From the same interest, he seemed to have acquired the manuscript on astronomy transmitted by the southern barbarians. Two different points can be detected in comparison with the *Kenkon Bensetsu*.

(a) In the *Nanban Unkiron*, the astronomical part comes first and the explanation on terrestrial phenomena as well as four elements follow, the order being quite opposite to the *Kenkon Bensetsu*, and the same sequence as in the *Nigi Ryakusetsu* and Gomez's original text.

(b) Each passage is shorter than the one in the *Kenkon Bensetsu*. We can also find quotations from Chinese classics which cannot be found in the *Kenkon Bensetsu*. Quotations are from *Nei Jing*, a classic medical publication; the *Book of Change* and Confucian *Annalects*. Together with the term *yun qi* in the title, and the fact that *Su Wen* in the *Nei Jing* is famous for its insertion of the theory of *yun qi* in the Tang dynasty, the existence of a chapter entitled "On blood, phlegm, yellow bile, etc." suggests that this piece of work may have been meant for medical practioners. It is quite interesting when we remember that Chuan (Ferreira) worked as a medical practitioner and was sometimes summoned to the Dutch factory on Deshima for consultation.

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[22] Cf. Ohya Shin'ichi, "*Kenkon Bensetsu* no ichi ihon — *Nanban Unkiron-*" (Another version of the *Kenkon Bensetsu* — *Nanban Unkiron-*), *Kagakushi Kenkyu*, no. 14 (1950), pp. 35-39.

(2) *Nanban Tenchiron* (A discussion by the southern barbarians on the heavens and the earth) (Preserved in the Kano Collection, the Library of Tohoku University).

The text is the same as the first: *Nanban Unkiron*. One point which is worth mentioning is the seal at the very end, which reads "Soko". If "Soko" in the seal refers to Yamaga Soko, a famous Confucian scholar, it is quite interesting, for it has never been claimed that Yamaga Soko took any interest in astronomy.

(3) *Tenmon Biyo* (Compendium for Astronomy).

The following differences are to be pointed out, compared to the Kenkon Bensetsu:

(a) this hardly discusses the four elements;

(b) discussions on meteorological phenomena, tides and earthquakes are missing;

(c) there is no reference to climates.

We can conclude from the above points that this version concentrates only on the heavenly sphere in Aristotelian dichotomy.

(4) *Shidai Zensho* (A Complete Work on Four Elements) (preserved in Kyushu University).

I have had no chance to consult with this manuscript. We should note, however, that none of these manuscripts have Mukai's commentaries.