A New Discovery of Korean Astrolabe

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Abstract

The aim of this article is to offer new information on an astrolabe which was made in Korea and preserved in Japan. This instrument is very valuable since it is the only hitherto known astrolabe that was made in East Asia. The present author has investigated this instrument in detail and found many particular features. Especially interesting is the positions of the fixed stars shown in this instrument. We do not know how these positions were obtained, nor do we why this kind of astrolabe was manufactured in Korea.

1. Introduction

It was in 2002 that Mr. Togiya (磨屋), a resident of Omihachiman City in Shiga Prefecture, brought an astronomical instrument [Fig. 1] to his neighbor Yabu Yasuo (藪保男) who was then the trustee of the Oriental Astronomical Association (OAA). The instrument was purchased by Mr. Togiya's grandfather in about 1930 when he was in Taegu (大邱), Korea. He brought the instrument to Japan amidst the postwar turmoil. Mr. Yabu talked about this instrument at the monthly meeting of the Osaka branch of the OAA in July, 2002. Since I was not informed of the background at that time, I thought that the instrument was an astrolabe made in China. After careful examination, however, I can say that the instrument was made in Korea. No matter whether this astrolabe was made in China or Korea, it is very valuable because it was constructed by either Chinese or Korean hands with the knowledge of the Western astrolabe combined with the knowledge of the traditional East Asian astronomy. No such astrolabe has been known to us.

The Chinese or Korean instruments which are often called 'astrolabe' are in fact movable (rotatable) planispheres and not astrolabes in a proper sense. In the following I would like to describe the special features of Mr. Togiya's Korean astrolabe with comparison to other instruments.

2. Astrolabe and Planisphere

Planispheric astrolabe (or simply astrolabe) [Fig. 2] and movable (or rotatable) planisphere (or simply planisphere), which are similar in the basic function of indicating the position of stars with respect to the horizon at a given day and time, are different in the following points:

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Figure 1. Togiya's astrolabe.

Figure 2. An astrolabe possessed by the author.

(1) In astrolabe, a flat circular openwork plate with pointers indicating bright stars is mounted on the disc on which horizontal coordinate circles are engraved, and these are built in a hollow of the 'Mother.' In planisphere, on the other hand, the circular constellation plate is covered by the horizon plate where the celestial part is left open.

(2) In astrolabe, the stars are depicted as seen from outside the celestial sphere, while in planisphere the stars are arranged as they are seen from inside (i.e., from the earth). Thus the two are in the relation of inside out.

(3) Stereographic projection is used in astrolabe. On the other hand, azimuthal equidistant projection is used in most of planispheres, although stereographic projection is sometimes used.

Usually the north celestial pole is the center of the star plate in astrolabe and the outermost circle represents the Tropic of Capricorn. So the whole visible sky inside the Tropic of Capricorn is shown.

The planisphere which is used in the northern hemisphere of the Earth is of two types. In one type, the whole sky including the celestial southern hemisphere is drawn on one plate with the north pole as the center and thus the window representing the horizontal circle is a deformed ellipse. The other type has two sides with centers representing the

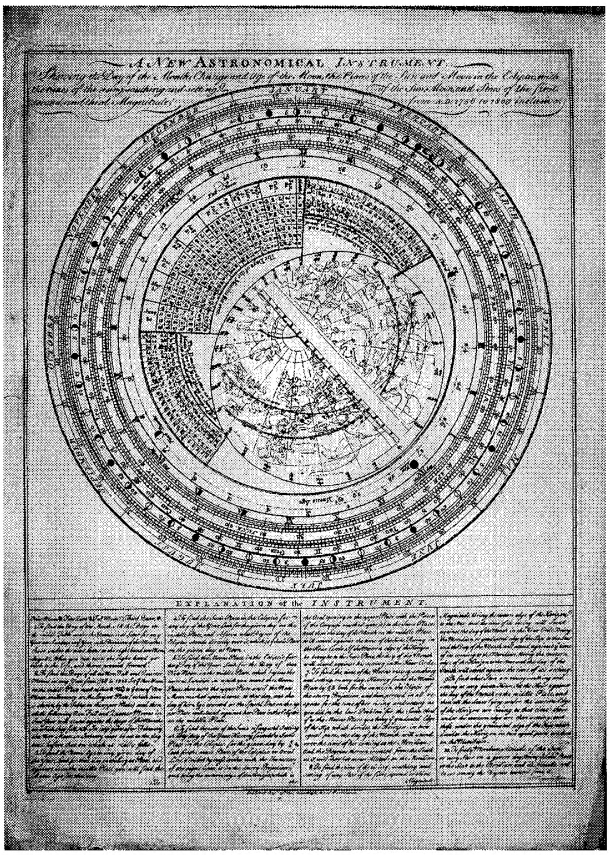


Figure 3. "A new astronomical instrument".

north pole and the south pole, respectively. Thus the shape of the horizontal window is of a waning moon. In the latter (the double-face type), the horizontal window consists of two curves, one of which is horizon and the other is east-west circle (in the case of the modern planisphere) or the equator (in the case of the classical ones).

The origin of the planisphere is not known, but it is younger than the astrolabe. When I visited Greenwich Observatory Museum in 1990, I found the explanation panel which read that planispheres were first printed in London cartographic firms in the 19th century. This instrument seems to have been of the whole sky type. I obtained a phanisphere at an antique book shop (whole sky type, with several printed papers laid). The description is given as "A New Astronomical Instrument" and "Published Aug. 29, 1757 according to act of Parliament" [Fig. 3]. This is intended for the latitude of 51.5° North (about the latitude of London). It is a quite functional instrument by which we can find lunar phases and some other elements of astronomy. The detailed explanation was written by a certain I. Ferguson. When the same instrument was on sale again at another antique book shop I bought it by the official budget of my university. These two instruments seem to have been offered for sale by some Japanese collectors.

That of double-face type can go back to 17–18th century, if the instrument preserved by Palace Museum in Beijing, which I will mention below, was made in Kangxi period (康熙, r. 1662–1722).

Therefore the explanation in the panel of the Greenwich Observatory Museum is not correct.

3. Planisheres and astrolabes in East Asia

In the second Japan-Korea History of Science Seminar (1983), I read a paper on the Korean planisphere preserved in Ch'angdŏkkung (昌德宮) palace [Fig. 4].[1] This was later removed and sent to the Museum of Royal Relics (Kungjung yumul chŏnsigwan 宮中遺物展示館). It is now preserved in the National Palace Museum (Kungnip kogung bangmulgwan 國立故宮博物館). At that time the official name of this instrument was not known, but later it turned out to have the name '*honp'yŏngŭi*' (渾平儀). This was made of metal, but essentially the same as the paper (?) instrument belonging to the 19th century[2] which is possessed by a Korean person, Pak Ch'an-u.

Two similar instruments made in Kangxi period are preserved in the Palace Museum of Beijing (Gugong bowuyuan 故宮博物院).[3] Both have two sides, one representing celestial northern hemisphere and the other southern hemisphere. In the *Ch'ŏnmun* we find a photograph of '*kanp'yŏngŭi*' (簡平儀), a collection of Seoul Museum of History, which consists of the circular star map of the whole sky with the north pole as the center

[1] Kazuhiko MIYAJIMA: "On the Celestial Planisphere Plate of the Ch'angdŏk Palace, Korea", *Kagakusi Kenkyu* (科学史研究 *Journal of History of Science*), Vol. 24, No. 155 (Aut. 1985). pp. 164–170.

[2] *Ch'ŏnmun: Hanŭl-ŭi Tori Ttang-ŭi Isang* (*Heavenly Pattern, The Rules in Heaven and Ideals on the Earth*), Kungnip minsok pangmulgwan (國立民俗博物館 The National Folk Museum of Korea), Korea, 2004. In the following I will refer to it as *Ch'ŏnmun*.

[3] *Qinggong xiyang yiqi* (清宮西洋儀器 *Scientific and Technical Instruments of the Qing Dynasty*), Shangwuyin-shuguan (商務印書館 the Commercial Press), Hong Kong, 1998.

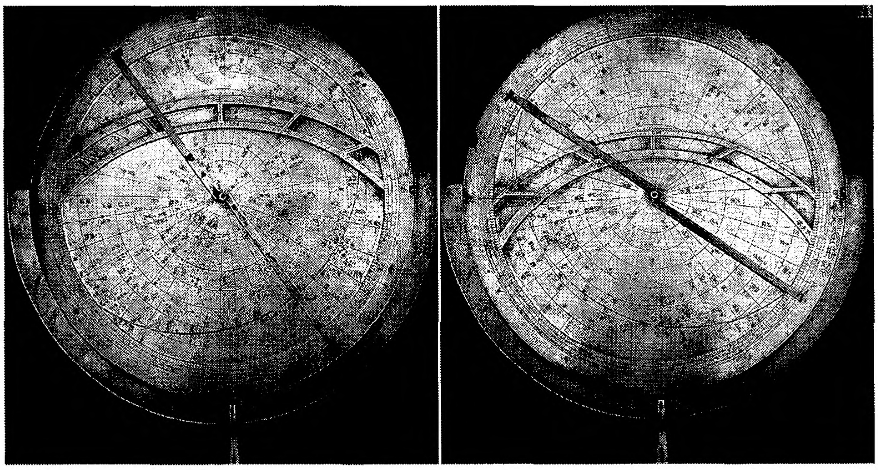


Figure 4. The *'honp'yŏngŭi'* in Ch'angdŏkkung palace from the *Ch'ŏnmun*.

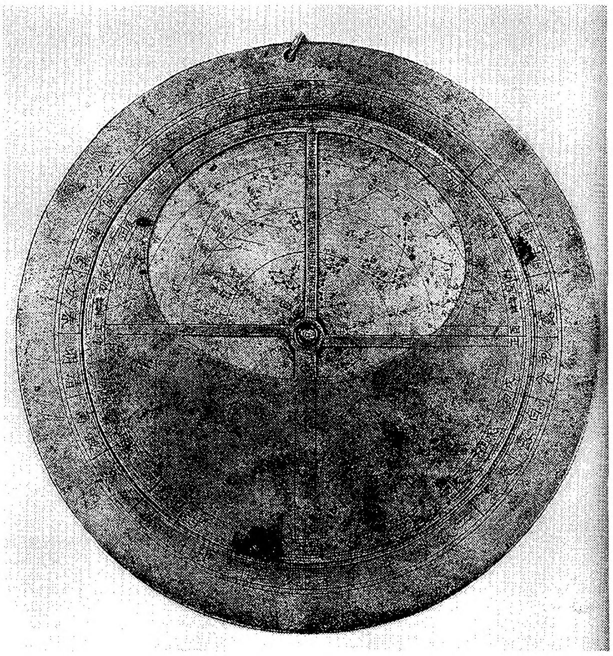


Figure 5. The *'kanp'yŏngŭich'* from the *Ch'ŏnmun*.

and which includes the southern hemisphere covered by the horizon plate [Fig. 5]. In both cases stars and constellations are those of Chinese tradition, but their positional values are based on the observation of the Jesuits who came to China. The graduations are also of the western style. The instrument preserved by the Paris Observatory[4] belongs to the same

[4] Suzanne Débarbat, "Korean Instruments in the Paris Observatory Collections," *Astronomical Instruments and Archives from the Asia-Pacific Region: Proceedings of an International Conference held in Korea in July 2002*, Yonsei University Press, 2004.

category, although we are not sure whether they were made in China or Korea.

According to a paragraph on the Western Instruments (*xiyuyixiang* 西域儀象) in the *Tianwenzhi* (天文志 Astronomical Section) of the *Yuanshi* (元史 *Yuan Dynasty History*), an astrolabe was made by Jamal al-Din (*Zhamaluding* 札馬魯丁) in the Yuan Dynasty. Toward the end of the Ming Dynasty, a manual of astrolabe, the *Astrolabium* (1593) written by Christopher Clavius (1538–1612),[5] was translated into Chinese by Li Zhizao (李之藻, 1569–1630) with the title of the *Hungai tongxian tushuo* (渾蓋通憲図説 *Explanation of the Coordinates of the Celestial Sphere and Vault*, 1607). In the same period Sabbathinus de Ursis (熊三拔, 1575–1620) wrote the *Jianpingyi shuo* (簡平儀説 *Explanation of the Simple Planispheric Instrument*, 1611), but the instrument explained here is different from the planispheres which are preserved in the Palace Museum in Beijing or from those which are in Seoul Museum of History (In the *Ch'ŏnmun* two other instruments which were made following the instruction of the *Jianpingyi shuo* are described). But they are neither a planisphere nor an astrolabe. In the *Huangchao yiqi tushi* (皇朝儀器圖式 *Illustrated Regulations for the Instruments of the Present Dynasty*) and the *Huangchao liqi tushi* (皇朝禮器圖式 the *Illustrated Regulations for the Ceremonial Regalia of the Present Dynasty*, 1759), which belong to the Qing Dynasty, the '*jianpingyi*' (簡平儀) [Fig. 6] is reported to have been made. But when we see the figures drawn there, we know that it is a double-sided planisphere and therefore it is not identical with that which is described in the *Jianpingyi shuo*. It is of the similar type to two instruments photographed in the *Qinggong xiyang*

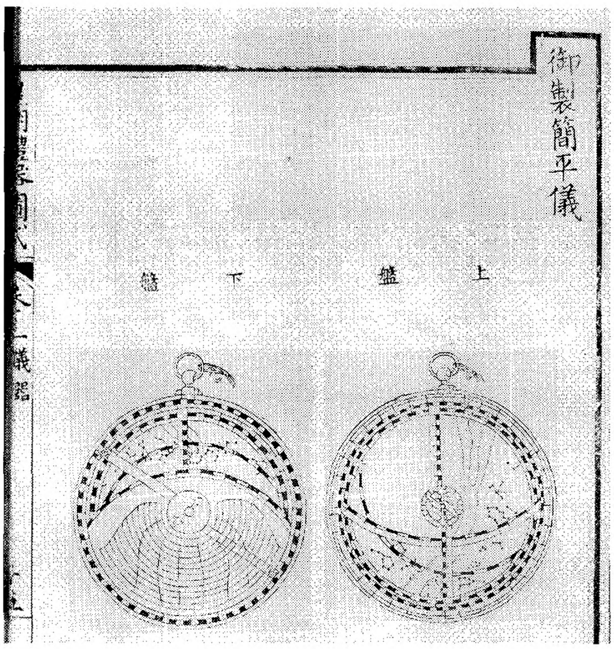


Figure 6. From the *Huangchao liqi tushi*.

[5] I thank Mr. An Tae-ok (安大玉) who helped me to see the photographs of the original Book by Christopher Clavius.

yiqi, although the design is not identical. There has been no report of existence of Western or Islamic astrolabe in China. And further, it seems that no astrolabe has been made in China based on the *Hungai tongxian tushuo*.

In the case of Korea, there was a mistake in English translation when they labelled "astrolabe" to the '*p'yŏnghonŭi*' (平渾儀) possessed by Mr. Pak Ch'an-u and to the '*honp'yŏngŭi*' (渾平儀) of the Ch'angdŏkkung palace. A photograph of astrolabe appears in the *Korean Astronomy* (1936) written by Carl W. Rufus, on which about 30 stars are shown. But it is not clear whether it was brought from the West or made in Korea, and we cannot see what has become of it since then. No instrument that we can call 'astrolabe' seems to have survived in Korea.

In Japan, an instrument similar to the planisphere [Fig. 7] is found in Nagakubo Sekisui's (長久保赤水, 1717–1801) *Tensho kankisho* (天象管闚鈔 *Summery of Narrow View to the Heavenly Phenomena*, 1774) and *Tenmon seisho zukai* (天文星象圖解 *Illustrated Explanation of Stars and Constellations*, 1824). But the horizontal window is of a circular figure. All the classical star maps in China, Korea and Japan are drawn by the method of azimuthal equidistant projection, and Sekisui's drawing follows this method too. In the case of stereographic projection, outline of the horizontal window is drawn in a circle, but when azimuthal equidistant projection is used outline should be a deformed ellipse. It seems that Sekisui did not know this fact.

A mariner's astrolabe, which is different from the usual planispheric astrolabe which we are discussing now, is introduced as '*asutororabiyo*' in the *Gen'na kokaisho* (元和航海書 *Navigation Book of Gen'na Period*, 1618) and '*isutarahi*' in the *Ryochi shinan* (量地指南 *Guide for Land Surveying*, 1797). A sample made of iron is actually preserved in the

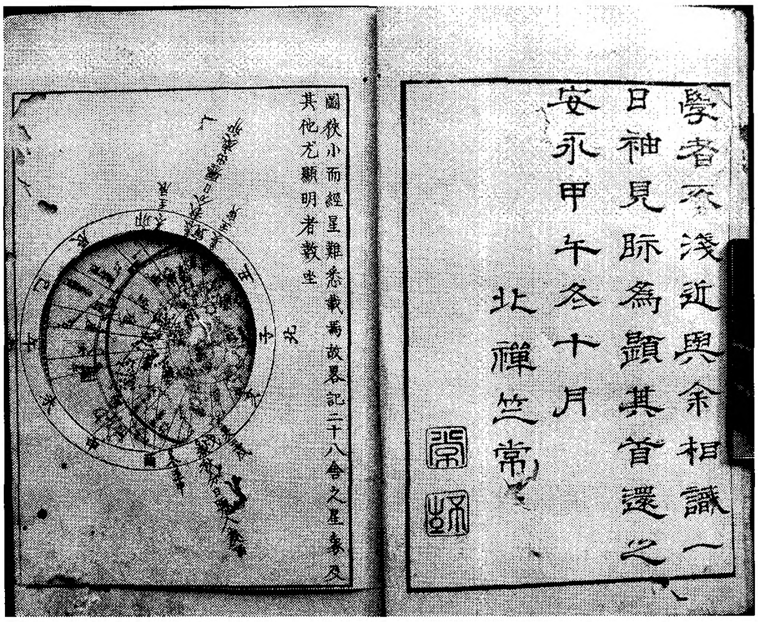


Figure 7. From the "*Tenmon seisho zukai*".

Tenri University Library, etc. But usual planispheric astrolabe was not made nor brought to Japan.

4. The astrolabe of Mr. Togiya

Mr. Togiya's astrolabe consists of the Mother and the Spider, each made of brass. The diameter of the Mother is about 16.9 cm (the vertical length is about 18.9 cm because the Crown is attached), while that of the Spider in the ecliptic circumference is about 9.8 cm. When I looked at it first, the Spider was attached by mistake on the back side of the Mother. According to Dr. Jeon Sang-woon (全相運), the materials of the pivot seem to be different from the main body, and it may have been made later. I guess that the Spider was attached wrongly to Mother when the pivot was remade. On the face side of the Crown [Fig. 8], Chinese characters "約菴尹先生製" ('made by the teacher Yag-am, Yun') and a square seal impression with characters 'yussiban' (柳氏班) is inscribed. On the back side of it we read the characters which mean 'The north pole appears 38 degrees above the horizon. Made in the year '*Kŏllyung chŏngmi*' (北極出地三十八度　乾隆丁未為) [Fig. 9].

It is usually the case that a set of horizon discs where horizontal coordinate lines corresponding to various latitudes are mounted under the openwork constellation disc (Spider), but in the case of Togiya's instrument, only the horizontal coordinate lines corresponding to 38 degrees are drawn on the face side of the Mother. It is different from the usual form in that there is no hollow in the body board of the Mother. In the proper case, a sighting device for altimetry should be attached on the back side, and a ruler to set a constellation

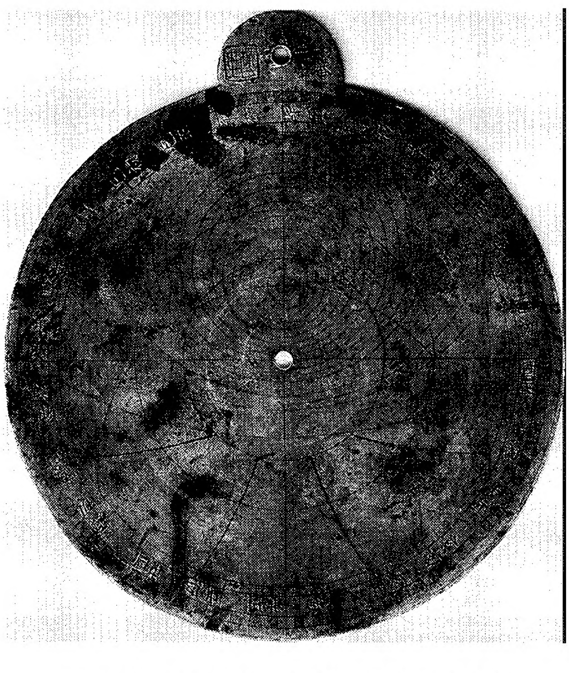


Figure 8. The face side of Togiya's astrolabe.

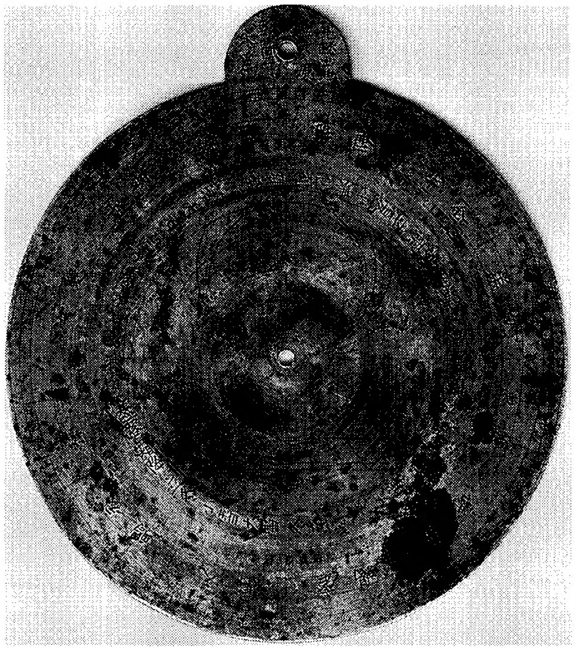


Figure 9. The back side of Togiya's astrolabe.

disc for the desired date and time should be attached on the face side of the Mother. But the Togiya's has neither of them.

It seems that by the words '38 degrees above the horizon' the latitude of the observation place was expressed in the Chinese degree unit. This is equal to about 37.45° north, a bit to the southward than the latitude of Beijing and it corresponds to that of Seoul. This expression '38 degrees' was always used as the standard positon of the north pole above the horizon in the Koryŏ (高麗, 918–1392) and Chosŏn (朝鮮, 1392–1896) Dynasties. But, as for the curving of scales and circles, the Western unit of 360 degrees was used. Because the center hole just overlaps on the determining point, it is not clear whether circles of the instrument were drawn so that they might correspond to this latitude. But it seems that they almost agree. The Chinese era names were very commonly used in the Korean Dynasties, and the year '*Kŏllyung chŏngmi*' (乾隆丁未, '*Qianlong dingwei*' in Chinese) corresponds to A. D. 1787. The family name Yun (尹) is very popular in Korea. In addition, as I mentioned above, the grandfather of the owner of the instrument purchased it in the Korean city Taegu in about 1930. So we can conclude that it must have been made in Korea. We have no information about Yun Yag-am (尹約菴) who made it. It seems that Yag-am is his pen name. According to Dr. Jeon Sang-woon, the '*sŏnsaeng*' (先生, teacher) was often used as the honorific title for a scholar teaching in a local private elementary school during the Chosŏn Dynasty. It is not clear what the name 'yussiban' means.

The outer circumference of the Spider (a diameter of 9.8 cm/ width 0.6–0.7 cm) represents the ecliptic, and it is divided into 24 parts. The names of the twenty four fortnightly seasons are engraved on each division. The circumference is graduated by 2 degrees. The tips of splinter-shaped projections represent fixed stars. Only 11 stars, which I will discuss

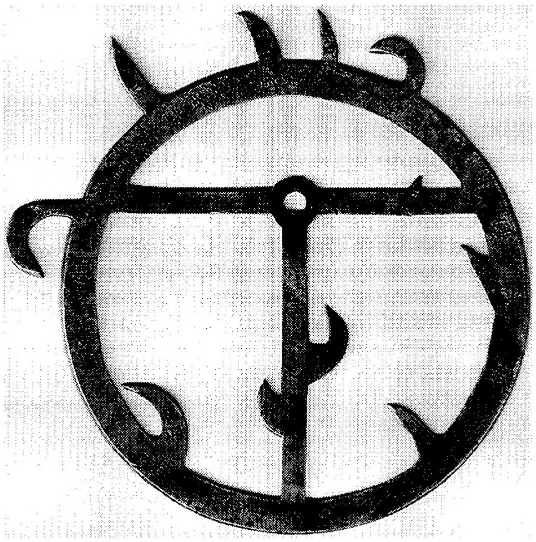


Figure 10. The Spider of Togiya's astrolabe.

later, are shown together with Chinese names [Fig. 10].

The center hole of the face side of the Mother is the celestial north pole. The Spider can be rotated around a pivot which is inserted in this hole. A circle with the diameter 16.7 cm is carved inside the outermost rim, and probably the maker intended to cut the disc in a circular form using this circle as an outline. Graduations of 2 degrees are engraved between the two concentric circles of which the diameters are 16.1 cm and 15.4 cm, and each graduation is alternately shadowed with slant lines. The part inside of it is divided into 24 hours equally, and characters *ch'o/chu* [6] (初 'beginning') and *chŏng/zheng* (正 'median') after the names of 12 *chi/zhi* (支 'double hours') are engraved in the clockwise order. The uppermost and undermost points are the borderline of the beginning and the median of *o/wu* (午 the seventh) and *cha/zi* (子 the first) double hours, respectively. Inside of them are three concentric circles representing the Tropic of Capricorn, the equator and the tropic of Cancer from outside, respectively. In the upper part, horizontal coordinate lines are drawn. The centers of the almucantars (circles of the same altitude) shift little by little according to the altitude, and the bigger (lower altitude) surrounds the smaller (higher altitude) one after another. The centers of the circles converge at the zenith. From the relations of the north pole and the almucantars, we can estimate the latitude as 37–8° north. The arcs passing through the zenith are equal azimuth lines. In the lower part of this face, four arcs and a central straight line are engraved marking the five time divisions in a night time.

On the back side of the Mother, threefold scale ring is engraved at the marginal region. These are chopped in different graduation, the outermost one in 2 degrees, middle one in 10 degrees, and the innermost one in 30 degrees which correspond to zodiac signs, namely, Cancer (巨蟹), Leo (獅子), Virgo (雙女, 'Two Women'),[7] Libra (天秤), Scorpion (天蝎),

[6] Hereafter I Romanize both Korean and Chinese ways of reading the same character.

[7] I added literal English translation only when the original meaning was much modified.

Sagittarius (人馬, 'Man and Horse'), Capricorn (磨羯, phonetic translation of Sanskrit Makara), Aquarius (寶瓶 Treasure Pot), Pisces (雙魚, 'Two Fish'), Aries (白羊), Taurus (金牛), Gemini (陰陽, 'Man and Woman'), in counterclockwise order from the upper left. Leaving out a little gap inside the Zodiac belt, there is another belt graduated in 2 degrees, and a wide leap inside of this embraces a seasonal belt graduated in 24 fortnightly periods: Summer Solstice (夏至), Little Heat (小暑), Severe Heat (大暑), Autumn Beginning (立秋), Heat Disposal (処暑), White Dew (白露), Autumnal Equinox (秋分), Cool Dew (寒露), Frost Falls (霜降), Winter Beginning (立冬), Little Snow (小雪), Heavy Snow (大雪), Winter Solstice (冬至), Little Cold (小寒), Severe Cold (大寒), Spring Beginning (立春), Rain Water (雨水), Awaking Hibernation (驚蟄), Spring Equinox (春分), Clearly Bright (清明), Grain Rain (穀雨), Summer Beginning (立夏), Little Fullness (小満), Sowing Awns (芒種), respectively in counterclockwise from the upper left. The inside of this seasonal belt is divided into upper and lower parts. The upper part has arcs useful for converting times between equal and unequal time reckoning system, and the lower part is a diagram to determine the length of shadow of the gnomon from the sun's elevation.

These features are very similar to those in the figures of the *Hungai tongxian tushuo* [Fig. 11] [Fig. 12]. So we guess that the maker of this instrument made use of this book in order to construct this astrolabe, because there might have been no other document available. But some questions remain about the stars shown in the Spider. I discuss them

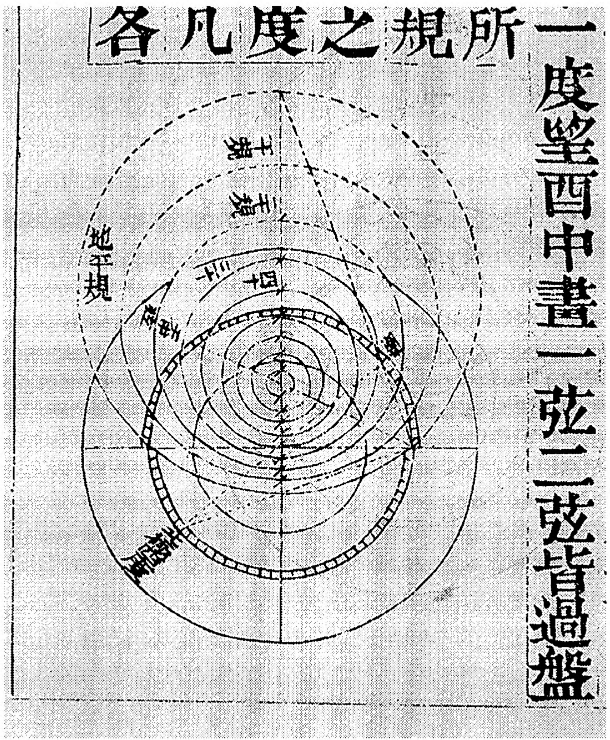
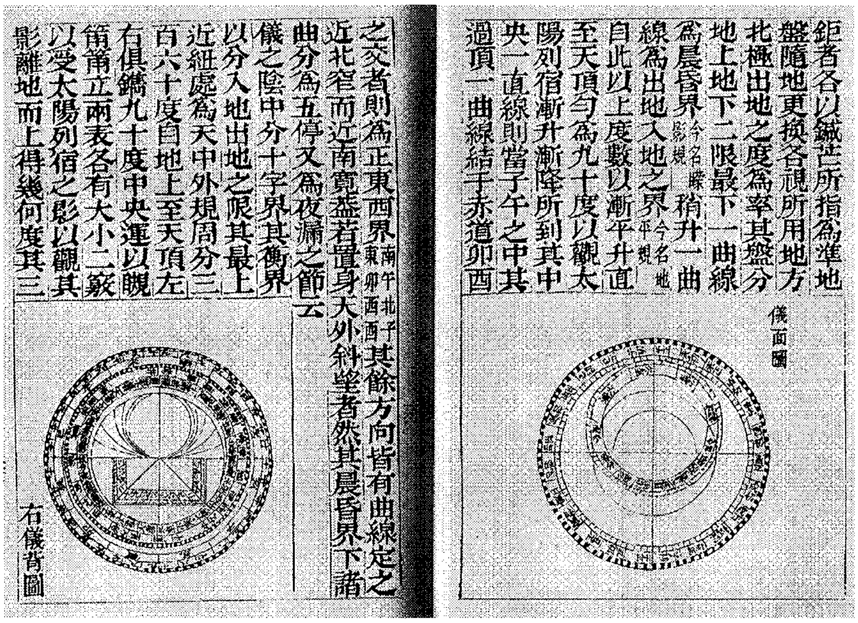


Figure 11. From the *Hungai tongxian tushuo*.


距者各以鍼芒所指爲準地
盤隨地更換各視所用地方
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儀之陰中分十字界其衡界
以分入地出地之限其最上
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Figure 12. From the *Hungai tongxian tushuo*.

in what follows.

5. The stars of Mr. Togiya's astrolabe

As I mentioned above, 11 stars are shown in the spider of this astrolabe. I measured the right ascension and declination of these stars, and compared them with the positional values listed in the *Hungai tongxian tushuo* in Table 1. It is unavoidable that the measurement is accompanied with some errors. I added theoretical values of P.V. Neugebauer for two dates, as well as the values listed in the *Lingtai yixiangzhi* (靈臺儀象志 *Records of Astronomical Instruments of Imperial Observatory*, 1673).

Out of the stars in the astrolabe only that which is appended by the name '*Hou*' (候, identified with α Ophiuchi = Ras alhage) is missing in the *Hungai tongxian tushuo*. I wonder why the maker chose this particular star although the stars which are listed in the three different parts of the book are more than those in the astrolabe. Furthermore, we do not know on what source the positions of the stars are based. There are errors in the process of its production besides the errors in reading the position of the stars in the spider, and the former errors seem more significant. Therefore, it is not possible to decide whether the values in the spider agree or not with any of other values listed in such books as the *Lingtai yixiangzhi*, *Yixiang kaocheng* (儀象考成 *Investigation of Astronomical Instruments*, 1756) and the *Hengxing lizhi* (恒星暦指 *Observational Methods of the Fixed Stars*, 1634).

In Table 2 I have shown the star positions recorded in the original text of Clavius. Stars shown in the table of the *Hungai tongxian tushuo* do not always agree with the stars of the original literature. Therefore, as for these stars, we can say that Li Zhizao, the

Table 1.

No.	Star name	Ident.	Astrolabe		*Hungai tongxian t.*		Neuge.(1604)		Neuge.(1787)		*Lingtai yixiangzhi*	
			R. A.	Decl.	R. A.	Decl.	R. A.	Decl.	R. A.	Decl.	R. A.	Decl.
1	big star of *Kui*	ζ And	11.2	29.5	10°43′	+34°23′	6.62	22.09	9.1	23.10	7°33′	22°37′
2	big star of *Bi*	α Tau	63.7	14.0	63°18′	+15°55′	63.32	15.64	65.9	16.10	64°18′	15°53′
3	4th star of *Shen*	α Ori	83.1	7.2	82°37′	+6°16′	83.44	7.25	85.9	7.40	84°27′	7°20′
4	southern star of *Nanhe*	α CMi	107.8	6.0	106°43′	+6°09′	109.63	6.17	112.0	5.76	110°42′	6°10′
5	first star of *Xing*	α Hya	138.3	-6.9	133°14′	−4°32′	137.03	-6.99	139.3	-7.70	137°58′	-7°06′
6	southern star of *Jiao*	α Vir	196.2	-11.1	195°13′	−8°16′	196.10	-9.06	198.5	-10.00	197°04′	-9°18′
7	4th star of *Di*	β Lib	226.1	-8.0	224°18′	−7°18′	223.96	-7.86	226.4	-8.60	224°54′	-8°03′
8	*Hou*	α Oph	260.1	11.0	—	—	259.13	12.91	261.3	12.72	259°54′	12°55′
9	*Zhinü*	α Lir	286.7	37.5	273°51′	+38°36′	275.87	38.45	277.4	38.60	276°18′	38°39′
10	central star of *Hegu*	α Aql	295.1	-0.9	288°57′	+7°19′	292.86	7.89	295.1	8.30	293°37′	8°09′
11	southern star of *Shi*	α Peg	345.4	13.2	338°00′	+12°41′	341.27	13.10	343.5	14.10	342°07′	13°27′

Table 2.

mag.	Star name	Ident.	Clavius(1600)		Neuge.No.	Neugebauer(1600)	
			R. A.	Decl.		R.A.	Decl.
3	cornu ♈(Ari), pracedens	β Ari	23° 20′	+17° 39′	41	23.17	18.82
2	Caput Meduſae	β Per	40° 55′	+40° 05′	62	40.61	39.35
1	Oculus ♉(Tau)	α Tau	63° 06′	+15° 56′	91	63.26	15.63
1	Dexter humerus Orionis	α Ori	83° 41′	+06° 21′	131	83.39	7.25
1	Hircus	α Aur	72° 06′	+45° 09′	105	71.80	45.50
1	Canis major	α CMa	97° 19′	-15° 54′	148	96.87	-16.22
2	Lucida Hydrae	α Hya	137° 19′	-05° 04′	215	136.98	-6.97
1	Cor ♌(Leo)	α Leo	146° 19′	+13° 44′	231	146.74	13.41
1	Cauda ♌(Leo)	β Leo	171° 49′	+16° 26′	269	172.14	16.81
1	Spica ♍(Vir)	α Vir	195° 55′	-08° 58′	300	196.05	-9.04
1	Arcturus	α Boo	209° 23′	+21° 49′	315	209.36	21.30
2	Cor ♏(Sco)	α Sco	241° 16′	-24° 57′	372	241.26	-25.46
1	Lyra	α Lir	275° 15′	+38° 40′	428	275.84	38.45
1	Vitima aquae ♒(Aqr)	α PsA	339° 56′	-33° 24′	511	338.82	-31.72
2	Cauda Cygni	α Cyg	307° 22′	+44° 08′	471	306.96	43.89
2	Crus Pegaſi	β Peg	341° 01′	+25° 44′	513	341.13	25.94

translator, selected the stars by himself without following the original source. Yet, it is not clear where the coordinate values of those stars came from.

In Table 1 I pointed out those stars in the astrolabe whose positional error is too big to be regarded as the result of the error committed in the process of its manufacturing, as well as those stars in the *Hungai tongxian tushuo* which show a remarkable error in position. Neither the declination of 'the big (= the second) star of *Kui*' (奎大) in the astrolabe nor that in the *Hungai tongxian tushuo* agree with the declination of the star which is usually identified as such. In the vicinities of both positions there is no star which seems to correspond to it. The right ascension of 'the first (= big) star of *Xing*' (星第一) in the astrolabe is different from that in the *Hungai tongxian tushuo*. In this case the value of the latter is mistaken. On the other hand, the astrolabe contains a mistake in the right ascension of the '*Zhinü*' (織女, = the first star) and also in the declination of 'the central (= the second) star of *Hegu*' (河鼓中). The right ascension of 'the southern (= the first) star of *Shi*' (室南) in the *Hungai tongxian tushuo* shows a big error.

Considering these facts, I wonder where the positional values in the *Hungai tongxian* *tushuo* came from. Especially a big mystery is where our astrolabe craftsman obtained the data of the position of stars. Although most of positional data in the astrolabe agree with those in such books as the *Hungai tongxian tushuo,* the *Lingtai yixiangzhi*, the *Yixiang kaocheng,* and the *Hengxing lizhi*, there are some stars of which the position differs from that in these books. We cannot decide yet whether they were simply made in the process of its production or they were results of independent observations during which some errors crept in.

6. Conclusion

We may conclude that this instrument is the only astrolabe that was made in East Asia (China, Korea, and Japan), or, at least, that was made and still extant today in East Asia. We do not know yet what the craftsman's background was. Neither do we know his aim, nor the way how he obtained the information for manufacturing this astrolabe.

The most recent information I can offer is that, most probably, this instrument is to be handed over to a Korean museum from its present owner.

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