An Aspect of Islam Culture Introduced into China

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I. Introduction

Everyone probably knows that the main current of western culture introduced into China during the Yüan dynasty was that of Islam culture. It is true, of course, the dynasty witnessed a marked revival of Nestorianism which had been propagated throughout East Asia since the T'ang dynasty, the fresh introduction of the Franciscan order of Christianity into the Orient, and along with them the inflow of the culture of several Christian countries into China in various forms. Apart from these, however, the cultural intercourse between the East and the West on the Asiatic continent was no doubt largely achieved by two chief players—Chinese culture in the East and Islam culture in the West.

A number of scholars who investigated the history of the intercourse between the East and the West were of the opinion that the western culture which had found its way into China until the T'ang dynasty was chiefly Iranian, but being superseded by Arabian culture during the Yüan dynasty, the Iranian influence in the intercourse between the East and the West was completely expelled,—the position of Iran in the sphere of culture was all replaced by that of Arabia. Even those who detected the Iranian tone in the Arabian culture which forced its way into the East attached only an extremely slight and incidental value to it. Now Paul PELLIOT, the French authority on Orientalism, published a highly scholastic and generalizing lecture in 1912, entitled "Les influences iraniennes en Centrale et en Extrême-Orient."(1) In

(1) Revue d'Histoire et de Littérature religieuse, année et tome III, nouvelle série N. 2, mars-avril 1912, pp. 97–119. Japanese translation by Dr. Ryōsaburō SAKAKI 榊亮三郎. Geibun 藝文, Vol. 2, 3rd year.

this, PELLIOT gave a profoundly impressive suggestion as to Islam culture which made its way into China—the cultural contribution of the Iranian people to the East from ancient times, but the public paid little attention to his view on the period following the introduction of Islam, as if too much impressed by his argument concerning the period prior to the T'ang dynasty.

It would seem, at least, that our traditional view lays too much stress on Arabian characteristics. May it not be necessary to examine thoroughly the historical records of the Yüan and Ming dynasties? The present writer is of the opinion that it is high time that the old view should be re-investigated.

Of course, we by no means ignore the fact that the homeland of the Iranian people after the fall of the Sāsān dynasty (641 A. D., 20 A. H., the 15th year of *Chên-kuan* 貞觀) was subjected politically and religiously to the rule of Islam. Therefore, we certainly note in many reports the inevitable and conspicuous subjugation of Iranian culture to the Arabian. In spite of this, we should not disregard the flexibility and profundity of the cultural traditions of Persia, all Iran in a broader sense, which formed from ancient times the very centre and the strategic point on the continent in the intercourse between the East and the West. Even when it seemed deprived of its own glory in the past and reduced to a dependent and subject position only as a single link in Islam culture which was of Arabian origin, we could not ignore the position of Iranian culture even at this stage if we should search more intimate elements. May we not say that it would be the result of a somewhat superficial observation to identify the eastern advance of Islam culture with that of the Arabian language and science? We should at once free ourselves of such a predominant view, investigate the historical materials disinterestedly, and then positively consider the reality of this matter. We should like with this attitude to re-examine the position Iranian culture took in the intercourse between the East and the West after the diffusion of Islam culture in the light of the characteristics of the Islam culture which forced its way to the East. Only the present writer is no specialist of philology; he is only an outsider to astronomy or the science of calendar. This being the case, specialists in these various fields might detect in this study faults of logic or discrepancies of interpretation. Frank criticism on them is cordially invited by the writer. By the way, the reader is asked to understand that in this paper the term *Persia* stands in contrast to Arabia in the relation of languages, and the term *Iran* in other relations.

II. Names of Islam Instruments Recorded under the *T'ien-wên-chih* 天文志 of the *Yüan-shih* 元史

Mongols, even while they had their headquarters in the north of the great desert, were assimilating various cultures of the West and being influenced by them. This influence later found a factor in the contempt of the Yüan

dynasty for Chinese culture. Of all the western cultures, Islam culture was the most influential, and as Mohammedans who boasted this cultural education were appointed to the various important positions in the government, more and more cultural products of various Islam countries were imported into China. Among them, the most significant were astronomy and the science of calendar.

There were calendars introduced into China during the Yüan dynasty, among which the most concrete and significant were probably the names of 7 Islam instruments recorded in *T'ien-wên-chih* 天文志 of the *Yüan-shih* (Vol. 48), and 23 scientific records and 3 instruments recorded under Ssŭ-ti'en-chien 司天監 in the *Yüan-pi-shu-chien-chih* 元祕書監志 (Vol. 7) which were pointedo ut by Prof. Mikinosuke ISHIDA 石田幹之助. In the *T'ien-wên-chih* of the *Yüan-shih* are recorded in the following order the phonetic transcriptions of the original names and the Chinese translation of the seven instruments, under which the structures and functions are explained.

Hsi-yü-i-hsiang 西域儀象

(Islam Instruments)

世祖至元四年，扎馬剌丁，造西域儀象。

(In the 4th year of *Chih-yüan* 至元 under the reign of Shih-tsu 世祖, Jamāl ud-Dīn 扎馬剌丁 built Islam instruments)

(1) 咱禿哈剌吉 漢言混天儀也。

(2) 咱禿朔八台 漢言測驗周天星曜之器也。

(3) 魯哈麻亦渺凹只 漢言春秋分晷影堂(也)。

(4) 魯哈麻亦木思塔餘 漢言冬夏至晷影堂也。

(5) 苦來亦撒麻 漢言渾天圖也。

(6) 苦來亦阿兒子 漢言地理志也。

(7) 兀速都兒剌不定 漢言晝夜時刻之器也。

Excepting the fact that the person who built the seven instruments was a Mohammedan named Cha-ma-la-ting 扎馬剌丁 (札馬剌丁, 札馬魯丁), or Jamāl ud-Dīn, nothing definite about him can be known for the absence of biography or any other concrete material. The result of the present writer's investigation up to this time is roughly as follows. The foreigner seems to have come to China at an early date and distinguished himself as an astronomer. The following passage occurs under the Hui-hui-ssŭ-t'ien-chien 回回司天監 (the Hui-hui Astronomical Observatory) in the *Pai-kuan-chih* 百官志 of the *Yüan-shih* (Vol. 90): "When Shih-tsu 世祖 was still at his secret dwelling-place, he summoned from among Mohammedans Jamāl ud-Dīn and others who were versed in astronomy. They were recommended for their accomplishments, though not yet officially appointed to any post."(1) Thus when the Shih-tsu (Khubilai) was not yet enthroned, this man was invited to serve under him for his knowledge. No special office was created. As the ruler was enthroned, the Mohammedan in the 4th year of *Chih-yüan* (1267 A. D.) built the above-

(1) 世祖在潛邸時，有旨，徵回回爲星學者. 札馬剌丁等，以其藝進. 未有官署.

mentioned seven instruments and dedicated a book of calendar entitled *Wan-nien-li* 萬年曆 (Permanent calendar), according to the *Li-chih* 曆志 of the *Yüan-shih* (Vol. 52). As to this calendar, the writer will discuss it in the fourth section of this paper entitled "Characteristics of the *Hui-hui-li-fa*."

Jamāl ud-Dīn thus rendered considerable contribution in astronomy and the system of calendar, and as the personnel of the Hui-hui Astronomical Observatory was established in the 8th year of *Chih-yüan*, (1271 A. D.,) he was appointed to the post of T'i-tien 提點, its superintendent. (See the 1st day, Jên-hsü 壬戌, the 7th month, the 8th year of *Chih-yüan* in the official annals of the Shih-tsu of the Yüan dynasty.) It was probably prior to this, but, according to the section under T'i-ming 題名 in the *Yüan-pi-shu-chien-chih* (Vol. 9), at a period during the era of *Chih-yüan*, as Chi-hsien-ta-hsüe-shih-chung-fêng-ta-fu 集賢大學士中奉大夫, he seems to have transacted the affairs of the Pi-shu-chien 祕書監, and according to the section under Shê-chien 設監, in the same work (Vol. 1), in the 10th year of *Chih-yüan*, as two positions were created in the office of the Pi-shu-chien, the Mohammedan, as chief astronomer of the Hui-hui Astronomical Observatory, was appointed as head of the Pi-shu-chien, and remained at the post for a long time. It is evident that the Pi-shu-chien was the office in charge of books and records, and fortunetelling and secret writings for the successive Emperors. What became of this man, then? According to the section under Tsuan-hsiu 纂修 of the *Yüan-pi-shu-chien-chih* (Vol. 4), in the 23rd year (1286 A.D.), Jamāl ud-Dīn and others informed the Emperor of the necessity of compiling a book of geography, and their request was accepted by the Emperor and, as the result, the work of compiling geography on a large scale was launched in the following year. And he, retaining his former post, took charge of the new department for compiling geography, but as he did not understand Chinese, an interpreter was appointed exclusively to wait upon him, in the 25th year of *Chih-yüan* (1288 A.D.) according to the section under She-li-shu 設吏屬 in the *Pi-shu-chien-chih* (Vol. 1). The section under Tsuan-hsiu of the same book records his presentation of opinion on this work of compilation in the following year (26th year of *Chih-yüan* or 1289 A. D.). When was this task completed? The *Shih-pu-ti-li-lei* 史部地理類, in the *I-wên-chih* 藝文志 of the *Yüan-shih*, revised by CH'IEN Ta-chin 錢大昕, mentions "*Ta-i-t'ung-chih* 大一統志 in 755 vols.", and an interlinear note says: "In the 28th year of *Chih-yüan* (1291 A. D.), Jamāl ud-Dīn who was Chi-hsien-ta-hsüe-shih 集賢大學士 and Yü Ying-lung 虞應龍, minor officer in the record department, and others presented this."[1] This certainly indicates that this year saw the completion of compiling the geography of the whole Yüan territory. The preface to the *Ta-i-t'ung-chih* by Hsü Yu-jên 許有壬 of the last part of the Yüan dynasty, included in his collection of writings entitled "*Yüan Hsü-wên-chêng-kung Chih-chêng-chi* 元許文正公至正集" (*Chih-chêng-chi* 至

(1) 至元二十八年 (西紀一二九一) 集賢大學士朮馬魯丁, 祕書少監虞應龍等進.

正集 by *Hsü-wên-chêng-kung* 許文正公 of the Yüan dynasty) (Vol. 35), was a composition of his on the occasion of the publication of the geography in question. According to the preface, as is seen in the *Pi-shu-chien-chih*, in the 23rd year of *Chih-yüan*, ten years after the conquest of the whole land, the Emperor granted the petition of Jamāl ud-Dīn, and ordered him, Yü Ying-lung who was Fêng-chih-ta-fu Pi-shu-shao-chien 奉直大夫祕書少監, and others to collect and compile the materials. A passage reads "In the 28th year, the year of *hsin-mao* 辛卯, the book was completed in 755 vols. and entitled *Ta-i-t'ung-chih* (Geography of the whole Empire). This was installed in the Emperor's library." (1) And later, on the 21st of the 12th month, the 6th year of *Chih-chêng* 至正 (1346) under the reign of the Emperor Shun-ti 順帝, Pieh-êrh-ch'ieh-pu-hua 別兒怯不花 (Berkäbuqa) who was in the office of Chung-shu-yu-ch'êng-hsiang 中書右丞相, in forming the Emperor of the great value of this book for government, asked him to have it printed for permanent use lest it should be lost in the course of years, and his request was granted. It is recorded that on the 17th of the 2nd month the following year, or the 7th of *Chih-chêng* (1347), Hsü Yu-jên, by Imperial order, composed this preface to the compilation. So the task of compiling the geography planned by Jamāl ud-Dīn should be regarded as one of the most outstanding cultural enterprises of the Yüan dynasty. There may have been more than one person named Jamāl ud-Dīn; still it was no doubt one and the same person who built Islam instruments, presented the court with the calendar named *Wan-nien-li*, and acted as chief compiler of the *Ta-i-t'ung-chih*. He was a Mohammedan who was appointed T'i-tien (chief astronomer) of the Hui-hui Astronomical Observatory, and to other important positions. A study of his services in these offices and his cultural contribution would show how great a Mohammedan he was. A pity that no consistent observation has been made of the man and his services have often been slighted! The *Ta-i-t'ung-chih* 大一統志 (Geography of the whole Empire) in 1,000 vols. reprinted in *Ti-li-lei* 地理類, under *Shih-pu* 史部, in the *I-wên-chih* 藝文志 of the *Yüan-shih* (Vol. 2) compiled by CH'IEN Ta-chin, which, in the 7th year of *Ta-tê* 大德 (1303 A.D.), Po-lan-hsi 孛蘭肹 who was Chi-hsien-ta-hsüe-shih 集賢大學士, YÜEH Hsüan 岳鉉 who was Chao-wên-kuan-ta-hsüe-shih 昭文館大學士 and Pi-shu-chien 祕書監, compiled and presented to the court, was probably only a revision of the *Ta-i-t'ung-chih* compiled by Jamāl ud-Dīn. Unfortunately, the great part of this *Ta-i-t'ung-chih*, was lost in the downfall of the dynasty, and now only a little survives.

Returning to the main issue, we may now continue the investigation of the Islam instruments. Although this account is the most significant in the *T'ien-wên-shih* of the *Yüan-shih*, it seems to have attracted the attention of quite a few men. Paul PELLIOT, in his lecture above-mentioned, refers to this as follows:

(1) 二十八年辛卯書成，凡七百五十五卷，名曰大一統志，藏之祕府.

"C'est en persan que sont donnés dans les annales mongols les noms de ces magnifiques instruments astronomiques de bronze fondus à la fin du XIII[e] siècle, et dont certains, rapportés de Chine en 1900, ornet aujourd'hui la terrasse de Potsdam." (1)

He states that the astronomical instruments all bore Persian names, that they were of bronze and a few of them were brought over to Germany from China in the Boxers' Rebellion of 1900 to decorate the terrace of the Potsdam Palace. Though P. PELLIOT asserts that they were all of bronze, it will be seen later that some of the seven instruments were evidently of wood. His assertion seems to have been based on misunderstanding. The instruments which were then taken over to Potsdam were, not those of the Yüan dynasty, but those constructed by the Jesuits of the last part of the Ming dynasty or the beginning of the Ch'ing 清 dynasty. They are now returned to Peking to decorate the observatory there. What then became of the instruments Jamāl ud-Dīn constructed? Ernst ZINNER states that a few of them existed at the beginning of the 18th century, but attracted little attention of the Jesuits.(2) And CH'ANG Fu-yüan 常福元 says, in his *T'ien-wên-i-ch'i-chih-liao* 天文儀器志略 (Short History of Astronomical Instruments), "I am of the opinion that these seven instruments probably were not founded after all; even if they had been, they were never used." Dr. KUWABARA declares that no one knows what has become of the instruments later.(3) ZINNER's view may be questioned because of the absence of accurate evidence.(4) CH'ANG Fu-yüan seems to be running to an extreme. It may be said that, as the seven astronomical instruments seem to have attracted little or no attention of the world during the Yüan and Ming dynasties, they were perhaps used only while the constructors lived. A more adequate conclusion would be reached by further study.

PELLIOT, who, in asserting that the names of the astronomical instruments all bore Persian names, has furnished us with no concrete interpretation. Nor have later scholars gone further, so far as the writer's scanty knowledge goes, to investigate the original names represented by the transliterated words. They seem vaguely to infer them to be Persian or Arabian words. In this present case, however, both transliteration and translation are given fortunately; and under each instrument its structure and function are explained, so that even if one of them were given erroneously, it would not be difficult to identify the original successfully in the light of the rest. Firstly, from the fact that Jamāl ud-Dīn, the constructor, was a Mohammedan, these terms may be considered

(1) P. PELLIOT, *op. cit.*, pp. 117–118.

(2) Ernst ZINNER, *Geschichte der Sterunkunde*. p. 236. The German translation by ZINNER of the names of the seven instruments is rather careless and often incorrect.

(3) KUWABARA, *Tōyō Bummeishi Ronsō* 東洋文明史論叢, p. 416.

(4) On this question as to whether the seven astronomical instruments existed or not, the present writer must acknowledge the assistance rendered by Mr. Shigeru KANDA 神田茂 of the Tōkyō Astronomical Observatory, ane Messrs. YABUUCHI 藪内 and FUJIEDA 藤枝 of the Tōhō Bunka Kenkyūjo in Kyōto.

Persian as PELLIOT does. Seeing that it was Arabian astronomy that ruled over not only West Asia but the whole Islam world, Arabian words may have to be assigned to the original. Or they may be even words of another country, to our surprise. In order to lay the basis for interpreting these words as correctly as possible, it would be the most appropriate way after all,—in interpreting all the words most adequately and speedily,—to determine the original, even if not all the words could be set under the same category. From this point of view, the writer first of all noted the phrases ; 苦來亦撒麻, 漢言渾天圖 (*K'u-lai-i-sa-ma*, the *Hun-t'ien-t'u* in Chinese) under (5) and 苦來亦阿兒子, 漢言地理志 (*K'u-lai-i-a-êrh-tzŭ*, the *Ti-li-chih* in Chinese) under (6).

On comparing these two items, one may note that the original word rendered in the Chinese translation as *t'u* 圖 under (5) and *chih* 志 under (6) would seem to correspond to 苦來亦 (k'u-lai-i). The explanation under (6) recorded in the *T'ien-wên-chih* reads :

"Seven-tenths, painted blue is water. Three-tenths, painted white, is land. Rivers, lakes, and seas are marked with lines running across the face. It is divided into minute longitudes and latitudes for the benefit of measuring areas and distances." (1)

According to this, it would seem that *t'u* 圖 (map) was a far more precise word than *chih* 志 (record). The word *Ti-li-chih* might be understood to be a common *Ti-chih* 地志 (book of geography). Evidently these two items on the list being instruments, not books, the idea *chih* (record) could never have been suitable. Adopting the word *t'u*, therefore, for the time being, and searching a word in the original languages, the writer could not find any such word in Persian or Arabic which would correspond to the transliteration *k'u-lai-i* and would at the same time fit the meaning here translated. The reader will understand that the Persian language of this period was not Pahlavi, or mediaeval Persian, but had already undergone its transition to "modern Persian." A chronological study will easily prove this.

If one gives up the attempt to find out the original words through the study of the Chinese ideographs employed for transliteration and the ideographs employed for translation represented in the *T'ien-wên-chih*, and instead undertakes a study of the shapes of these two articles explained in the same book, it may be clear that, from (5) 其制以銅爲丸 (The shape is a ball made of copper), and (6) 其制以木爲圓毬 (The shape is a round ball made of wood), they were not planes, but spheres. The former was made of copper, while the latter was made of wood. If spheres, they would no doubt have been globes. Fortunately the Persian word which would stand for the globe and at the same time roughly satisfy the ideographs employed for transliteration would be *kurah, kurrah*. This word would seem to have been derived from *kurrat* 'globe', a noun derived from the Arabian verb *karra* meaning 'to

(1) 七分爲水，其色綠．三分爲土地，其色白．畫江河湖海，脈絡貫串於其中．畫作小方井，以計幅圖之廣袤，道里之遠近．

revolve, to recur, to circulate.' It is true, *kurah*, *kurrah* would not contain the last sound *i* (亦). But this will be considered later on. The assignment of 來 (lai) for *rah*—the *h* at the end of a word not being sounded—may be supported by the example of transcribing Tārāz, a city in Central Asia, by 討來思 (t'ao-lai-ssŭ). The two sounds *r* and *l* are often confused in transcribing with Chinese ideographs, the identical ideograph being used for the two sounds because of the absence of a Chinese ideograph to represent the *r* sound with.

From the foregoing, it may be inferred at once that (5) is a celestial globe, while (6) is a terrestrial globe. If so, that would be the original words for 撒麻 (sa-ma) in the *T'ien-wên-chih* meaning *Hun-t'ien* 渾天 (the whole heaven), and 阿兒子 *a-êrh-tzŭ* meaning *Ti-li* 地理 (geography). It is evident that the former word is *samā'*, a word in common with Persian and Arabic. There are quite a few words in the two languages which mean 'heaven'; *āsmā*, *āsmān* might be given here as Persian words which resemble the word adopted in the text. The latter word is adopted both in the *Hui-hui-kuan-tsa-tzŭ* 回回館雜字 of the *Hua-i-i-yü* 華夷譯語 in the possession of the Toyo Bunko which is a manuscript copy of the Ming dynasty, and in the *Hui-hui-kuan-i-yü* 回回館譯語 of the *Hua-i-i-yü* alleged to be a compilation by Mao Jui-chêng 茅瑞徵 in the last part of the Ming dynasty. The former gives the original word and accompanies it with *t'ien* 天 (heaven), the Chinese translation, and transliterates it as *a-ssŭ-ma-ên* 阿思媽恩, while the latter simply gives *t'ien* 天 *a-ssŭ-ma* 阿思媽.(1) As these two books use different ideographs in transliteration, the identity of the two words may be questioned. But this should not worry the reader, because the different degrees of accuracy in transliteration would account for the different ideographs employed in the two books. There are several cases in the *Hua-i-i-yü* of transliterating the syllable *mān* with the ideograph *ma* 媽. The Toyo Bunko copy gives yü 雨 (rain) *pa-la-ên* 把剌恩 for the original word *bārān* and shih 世 (world) *chê-ha-ên* 者哈恩 for the original word *jahān*, while the *Hua-i-i-yü* by Mao Jui-chêng gives respectively yü 雨 *pa-lang* 把郎 and shih-chieh 世界 *chê-hang* 者杭. Many similar cases may be cited. A most detailed general biographical study of the *Hua-i-i-yü* is "Joshingo Kenkyū no Shinshiryō 女眞語研究の新資料 (New material in the study of the Jurchin language)" by Prof. Mikinosuke Ishida.(2) As to the *Hui-hui-kuan-tsa-tzŭ* and the *Hui-hui-kuan-i-yü*, the writer has already conducted a comparative study of the two works and published a study of the original words in them.(3) Therefore, no more instances will be cited here to encumber the reader. Hereafter in this article, the two books will frequently be quoted

(1) In this article the writer has consulted the copy in the possession of the Awa 阿波 Library originated from the latter.

(2) 桑原博士還曆記念東洋史論叢, *The Collection of the Studies of Oriental History in commemoration of the 61st birthday of Dr. Kuwabara.*

(3) K. Tasaka, "Linguistic notes on the Translated Words in the *Hui-hui-kuan-i-yü*, 回回館譯語." Tōyō Gakuhō, Vol. xxx, 1943.

for examples of transliteration. The former will be referred to as the Toyo Bunko copy and the latter as the Awa Library copy.

阿兒子 (a-êrh-tzŭ), then, must be a transliteration of *arẓ*, an Arabic word absorbed into the Persian vocabulary which means 'land, territory, the earth.' This corresponds to the Chinese translation, *ti-li* (geography), and also fits the context of the explanation in the *T'ien-wên-chih;* there would be no word more suitable than this for satisfying the transliteration.

It is now high time to deal with *i* which has been reserved. Now that the above two words have been explained as Arabic words thoroughly Persianized, though not native Persian, the next point which occurs to our minds is the use of the connective sound; a prominent phenomenon in forming phrases in Persian speech. There is perhaps no need to dwell upon this rule in Persian grammar, but only a brief explanation may be made here as an aid to the better understanding for the reader. This is called *iẓāfa* or *iẓāfat* grammatically; and this *i* sound is called *kasra* or *kasrat*. This occurs in Persian; when two or more words are successively in the possessive and the passive-possessive and the word in the passive-possessive precedes, the kasra or the *i* sound is added by iẓāfa to the end of the word in the possessive and then follows the word in the possessive. Similarly, when two or more words are successively the modifier and the modified, this grammatical rule is applied; as an adjective is placed as a rule after the noun it modifies, the adjective in this case is connected to the preceding noun by iẓāfa. It is true, in practical cases, there come up some fine technical points to be considered, when a kasra is sometimes omitted, but the general rule is as stated above. This is a unique point in Persian grammar which cannot be found in the Arabic language. In order to illustrate this abstract rule, a few examples will be given. To illustrate the relation between the modifier and the modified, here is the case of "glorious victory" in which *fatḥ* meaning 'victory' and *'azīz* meaning 'glorious' are combined by iẓāfa to read *fatḥ-i-'azīz*; likewise in the case of "beautiful flower", *gul* meaning 'flower' and *zībā* meaning 'beautiful' are combined by iẓāfa to read *gul-i-zībā*. And also as an illustration of the relation of the possessive and the passive-possessive:— 'declaration of war' is *i'lān-i-ḥarb*, *i'lan* meaning 'declaration' and *ḥarb* meaning 'war' being combined by iẓāfa; 'science of history' is *'ilm-i-tawārīkh*, *'ilm* meaning 'science' and *tawārīkh* (plural form) meaning 'history' being combined by the same rule.

If one is acquainted with the grammatical usage of the Persian language, *i* 亦 will readily be recognized as the ideograph representing a kasra (the *i* sound) produced by iẓāfa. So it would follow that (5) and (6) are Persian names, and evidently the former is *ku* (*r*) *rah-i-samā'*; the correct translation being 'globe of heaven' (the celestial globe); and the latter is *ku* (*r*) *rah-i-arẓ*, the true name being 'globe of the earth' (the terrestrial globe). The felicity of this translation for (6) may be recognized by referring to the account

in the *T'ien-wên-chih* on this instrument already quoted; and the propriety of (5) for the 'globe of heaven' will also be acknowledged by the following explanation in the *T'ien-wên-chih*.

"As for its construction, it is a sphere made of copper with the degrees of the solar orbit engraven slantwise on the surface with the 28 constellations engraven over it. Further, a single ring of copper is placed horizontally, with the degrees of the whole heaven marked and arranged in the order of the zodiac so as to correspond with the earth. Beside it are erected two single rings, one being tied to the horizontal ring north and south, with a copper rod formed into the north and south poles, and the other being tied to the horizontal ring east and west. On both are engraven the degrees of the whole heaven. It does not serve as a celestial globe to be moved about for making observation"(1)

Its construction is thus shown to be much more complex than the terrestrial globe.(2) As all the parts of the instrument were fixed, and probably in order to prevent it from being confused with the celestial globe which could be moved about for making observation, the word *t'u* was adopted. Be that as it may, the Chinese names *Hun-t'ien-t'u* 渾天圖 and *Ti-li-chih* given in the *T'ien-wên-chih* unfortunately tend to misguide the reader from the original meanings. Nevertheless, the complete solution of the problem as to the original names of the two astronomical instruments should tremendously reassure the investigator in solving the names of the remaining instruments.

A clue of solution has been obtained. Encouraged by the interpretation of the above two phrases, and carrying out a similar interpretation on *Lu-ha-ma-i-miao-wa-chih* 魯哈麻亦渺凹只 under (3) and *Lu-ha-ma-i-mu-ssŭ-t'a-yü* 魯哈麻亦木思塔餘 under (4) which seem to resemble the two phrases in the general nature of the transliterations, one may expect to be favoured with results. 亦 at the middle represents the *i* sound of izāfa which has already been dwelt upon. So one should search among the foreign words for the word preceding the *i* 亦 and the one following it. Evidently *lu-ha-ma* 魯哈麻 in common with (3) and (4) corresponds to *kuei-ying-t'ang* 晷影堂 of the Chinese translation. Lu-ha-ma in the present standard pronunciation would be *lu-ha-ma* or *lu-k'a-ma*; and the *kuei-ying-t'ang* would naturally suggest an apparatus of a sun dial. The common Persian words for this are only *dā'irah-i-hindī*, *dā'irah-*

(1) 其制以銅爲丸，斜刻日道交環度數於其腹，刻二十八宿形於其上．外平置銅單環，刻周天度數，列于十二辰位，以準地．而側立單環二．一結于環之子午，以銅丁，象南北極．一結于平環之卯酉．皆刻天度．卽渾天儀而不可運轉窺測者也．

(2) As to the extant celestial globe of the earliest period of Islam culture, see SARTON, G., *Introduction to the History of Science*, 1931, Washington; Vol. II,pp. 1014–15. The oldest extant celestial globes are the one in the possession of the Florence University, Italy,473 *A. H.* (1080–1081 A. D.) constructed jointly by Ibrahīm ibn Saiad al-Sahlī and Muḥammad his son; the one constructed in 622 *A. H.* (1225–1226 A. D.) by Saisar ibn Abī 's-Sāsim (*ibid.* p. 1014) and al-Muzaffar at-Tūsī (*ibid.*, p. 506, p. 623) in the possession of the Naples Museum.

i-sā'atī, and *daraājt*, while the Arabic *mizwalat*, *sā'at shamsīyati*, and *mīnā' us-sā'ati*. It was impossible to find the original word which resembles *lu-ha-ma* (or *lu-k'a-ma*). The Arabic which resembles this transliteration is *rukham* meaning only 'marble, alabaster.'(1) Nevertheless, one could not help feeling a certain charm in this foreign word.

As the present writer was confronted by this difficulty, he happened to read Karl SCHOY's work, "*Sonnenuhr und spätarabische Astronomie*"(2) and came across a passage in which he gives with comments a German translation of a work in Arabic entitled "Über die ebene Sonnenuhr, genannt die Rukhāma [Marmorplatte]" by Muḥammad ibn Abī 'l-Fath Schams ud-Dīn as-Ṣūfī-'l-Miṣrī, a scholar of Cairo, who died there in 900 A. H., the 7th–8th year of *Hung-chih* 弘治 of the Ming dynasty (1494–5 A. D.). As previously stated, *rukhām* is a word originally meaning 'marble' and the sun-dial was made of this material, it came to be called *rukhāma*. And that the general term of a sundial seems to have been not always rukhāma but *basīṭa* may be inferred from Karl SCHOY's translation "die Konstruction der Basīṭa, genannt die Rukhāma".(3) *Basīṭa*, or more properly *basīṭat* originally meant 'surface, face of the earth, horizontal expansion,' and was applied to a sun-dial, especially a horizontal sun-dial. According to the author of this original work, the horizontal plate could be made not only of marble, but also of any hard wellbalanced substance. Everyone knows that the essential materials of the horizontal sun-dial consisted of a horizontal metal plate and a rod of a similar material erected vertical to the plate, namely the needle of the sun-dial. And according to SCHOY's translation, the *rukhāma* which aṣ-Ṣūfī invented was also a horizontal sun-dial.

It would now seem evident the *lu-ha-ma* recorded in the *T'ien-wên-chih* of the *Yüan-shih* was like a rukhāma, a horizontal sun-dial. However, the kuei-ying-t'ang for the equinoxes and that for the solstices in the *T'ien-wên-chih* would seem to have been built on a large scale, entirely beyond the general conception of a sun-dial, as they were called *t'ang* 堂 (hall, stall). The two, although called rukhāma alike, were completely different in construction. The kuei-ying-t'ang for the solstices seems to have been a vertical sun-dial rather than a horizontal one. Be that as it may, the thorough-going comprehension of the remarks on the two stalls is beyond the present writer. So he respectfully entreats the experts to enlighten him on this matter.

(3) "This is called in Chinese a stall for observing the vernal and autumnal equinoxes. It is of two rooms' space, with a narrow lateral opening running east and west cut on the back. Through this the sunbeam is let in slantwise. Within there is a stand which, in accordance with the

(1) See F. HIRTH & W. W. ROCKHILL, *Chau Ju-kua*. p. 120, n. 4. The stone called Lü-kan on the palacewalls in Ta-shih country, is interpreted by HIRTH and others as the transliteration of *rukhām*. It might be so; but it requires further investigation.

(2) ISIS., n. 18, Vol. VI, 1924, pp. 332–360.

(3) *ibid.*, p. 337.

shadow thrown by the sun, rises on the southern end and falls on the northern end. Over it a half-ring of copper is set facing upward. On it are engraven 180 degrees of the division of heaven, which are graded in accordance with the division of those of the earth. As to the upper half of heaven, a sharp-necked copper rod 6 *chih* in length and 1.6 *ts'un* in width is propped slantwise. The upper end is fastened to the centre of the half-ring, while the lower end rests on the half-ring. By this help one can go backward and forward and look through and observe the sun-beam running into the stall from one side, read the degrees and thus determine the vernal and autumnal equinoxes."(1)

(4) "This is called in Chinese a stall for observing the summer and winter solstices. A stall of 5 *chien* 間 in width is built under which is dug a hole 22 *chih* deep. A narrow opening north and south cut on the back which directly lets in the sun-beam. In accordance with the opening, a wall is erected. From the wall is hung a copper rod 10 *chih* 6 *ts'un*. On the wall are drawn the degrees of heaven. A half of it is graded. By this help also one can go backward and forward and look through and observe straight the sunshine let in through the roof, and thus determine the winter and summer solstices."(2)

After studying the article by SCHOY, the writer consulted dictionaries again concerning the word rukhāma, and found that *rukhāmat*, the feminine form of *rukhām*, sometimes means a sun-dial. Rukhāmat, when adopted into Persian, is very apt to become *rukhāmah*; in either case, the final letter *t* or *h* is not sounded; so the word could by no means be distinguished phonetically from rukhāma. It may be that rukhāma in SCHOY's article is a mistransliteration of rukhāmat. *Lu-ha-ma* is probably a transliteration of rukhāmah, because the names of the two astronomical instruments recorded in the *T'ien-wên-chih* of the *Yüan-shih* were beyond question words of Persian origin.

Aṣ-Ṣūfī, the author of the original work which SCHOY translates, describes this rukhāma or the horizontal sun-dial, as if boasting a remarkable improvement on the instrument previously employed. It is unknown, however, when this term rukhāma for the horizontal sun-dial began to be used in Islam world. It may have been used from remote antiquity, seeing that this name is known to have been included in the Persian vocabulary at the beginning of the Yüan dynasty. This could be ascertained neither by referring to dictionaries in the writer's possession, nor to SCHOY's paper. However, since he recognizes considerable significance in the name and construction as to the history of later Arabian astronomy, this book by aṣ-Ṣūfī may be the only one handed down in Islam

(1) 漢言春秋分晷影堂. 爲屋二間, 脊開東西横罅. 以斜通日晷. 中有臺. 隨晷影南高北下. 上仰置銅半環, 刻天度一百八十, 以準地. 上之半天, 斜倚銳首銅尺. 長六尺, 闊一寸六分. 上結半環之中, 下加半環之上. 可以往來窺運, 側望漏屋晷影, 驗度數, 以定春秋二分.

(2) 漢言冬夏至晷影堂也. 爲屋五間. 下爲坎, 深二丈二尺. 脊開南北一罅, 以直通日晷. 隨罅立壁. 附壁懸銅尺, 長一丈六寸. 壁仰畫天度, 半規其尺. 亦可往來規運, 直望漏屋晷影, 以定冬夏二至.

bibliography. If you let alone its comparative merit or other points, it would follow that the instrument was constructed in China by a Mohammedan in the 4th year of *Chih-yüan* (1267 A. D.) or 665-6 A. H., — that is, more than two hundred years before it was built in the homeland of Islam, and the name was recorded in Chinese bibliography prior to its record in Islam bibliography. Therefore, *lu-ha-ma* in the *T'ien-wên-chih* of the *Yüan-shih* would seem to be the earliest instance ever known where the name rukhāma is recorded.

The first half of the original word for the the two kuei-ying-t'ang has thus been explained, and on its strength one may proceed to solve the rest of the words.

Would it be possible to get the meaning vernal and autumnal equinoxes from the phrase *miao-wa-chih* 渺凹只? Consulting dictionaries, one would find the Persian words for vernal and autumnal equinoxes, or equal division of day and night, are *i'tidāl-i-rūz wa shab*, and *i'tidāl-i-lail-wa'n-nahār*, the latter being the Persian reading of an Arabic word. There is another Arabic word *al-i'tidāl' sh-shamsī*. *I'tidāl* in all these three words is a noun derived from *i'tadala*, the eighth form of the Arabic verb *'adala* which means 'to be equal, to be straight, to keep the middle ground between two, to be exact.' Only a glance will show that this will not do for the transliteration. Nor will the adjective *mu'āddil*, *mu'ādalat* derived from this word.

What word would resemble the Chinese pronunciation 渺凹只 (miao-wa-chih)? As for the ideograph 渺 (miao), owing to the absence of examples of translation, discussion may be reserved till later. As for 凹 (wa), there are no direct examples of transliteration either, but the original pronunciation may be inferred from *wa* 洼 which has the same pronunciation as 凹. In the Toyo Bunko copy, 洼 is always used for transliterating the sound *wa*, as in the case of *hêi-wa* 黑洼 for *hawā*=t'ien-chi 天氣 (weather), *tieh-wa-êrh* 迭洼兒 for *dīwār*=chi'ang 墻 (wall), *chu-wa-ên* 主洼恩 for *jawān* (youth, young), *a-wa-tsu* 阿洼子 for *awāz*=shêng-yin 聲音 (voice, sound), *sa-tzŭ-wa-li* 撒子洼力 for *sāzwārī*=Ho-mu 和睦 (reconciliation), and *t'ê-wa-lieh-hêi* 忒洼列黑 for *tawārīkh*=shih 史 (history). Now examples for *chih* 只 may be searched in the same book. The ideograph 只 pronounced *ji* as in the case of *chih-tê* 只得 for *jidd*=ch'in 勤 (service), and *mo-ssŭ-chi-tê* 默思只得 for *masjid* (temple), while the Awa Library copy definitely assigns *k'u-chih-k'u-li* 苦只枯力 for *kūzi gūlī*=po-yü 鉢盂 (jug, bowl), *nai-hu-chih-êrh* 乃謊只兒 for *nakhjīr*=huang-yang 黃羊 (mountain goat), *a-êrh-chih* 阿兒只 for *arj*=tien-ê 天鵝 (swan), and *mu-chih-mu-a* 母只母阿 for *majmū'*=ts'ung 總 (total, sum), showing that 只 was used for transliterating not only *ji* but also *j*, *jī*, and furthermore *zi* as in the case *kūzi gūlī*. No example of 渺 (miao) has been found, but it is certain that the word begins with the consonant *m*. Therefore, the word sought for must surely contain the three consonants *m*, *w*, and *j* (*z*).

Wāzana the third form of the Arabic verb *wazana* has the meaning 'to balance, to poise, to match', and the noun *muwāzanat* from it and *muwāzanah*,

a Persian corruption, satisfy the conditions to some extent, but the word-ending is not sufficiently satisfying. Now, *wāzā*, the third form of the Arabic verb *wazā*, has the meaning 'be equal, parallel, quite opposed', and its adjective form is *muwāzī*. This is a little corrupted in Persian, being sometimes pronounced *mu'āzī*. The original word of *miao-wa-chih* 渺凹只 probably was *muwāzī*, used in the meaning of dividing day and night equally from the meaning '*be equal*' as mentioned above. An adoption of the meaning 'being quite opposed' may not be unreasonable, because according to the Mohammedan calendar dwelt upon in Section IV, when the sun goes round the 12 zodiacal constellations, Paiyang (shu) kung 白羊 (戌) 宮 (Aries) which the sun reaches on the vernal equinox and T'ien-ch'êng (ch'ên) kung 天稱 (辰) 宮 (Libra) which the sun reaches on the autumnal equinox are quite opposed in the system. For this reason the original phrase of 魯哈麻亦渺凹只 may be set down as *rukhāmah-i-muwāzī*.

Now what about *mu-ssŭ-t'a-yü* 木思塔餘 in the phrase *lu-ha-ma-i-mu-ssŭ-t'a-yü* 魯哈麻亦木思塔餘 under (4) rendered tung-hsia-chih-kuei-ying-t'ang 冬夏至晷影堂 in Chinese? It would be natural to suppose this to mean tung-hsia-chih 冬夏至 (the winter and summer solstices). But *tung-chih* 冬至 (the winter solstice) and *hsia-chih* 夏至 (the summer solstice) are represented by different words and contain no common word as in the case of *ch'un-fên* 春分 (vernal equinox) and *ch'iu-fên* 秋分 (autumnal equinox). To coin one word for it, it might be *muqutatu'l-irqilābi'sh-shamsi* (points on which the sun revolves) and separately, 冬至 would be *rāsu'l-ḥada*, and 夏至 *rāsu's-sarṭān*. These would by no means satisfy the transliteration. If so, the original of this word should be sought, apart from the Chinese translation, from the point of view, for instance, of the construction of the instruments.

Sun-dials may roughly be divided into two classes: the horizontal and the vertical. And if *rukhāmah* was used as previously studied, in the correct meaning of the term in the *T'ien-wên-chih* of the *Yüan-shih*, kuei-ying-t'ang 晷影堂 (the sun-stalls) of the two kinds should both have been horizontal sun-dials. But the explantion under (4) would somehow give us an impression that (4) had not necessarily the nature of a sun-dial. Would it not be possible to obtain some hints on its construction from the word 木思塔餘?

The four characters 木思塔餘 at present pronounced *mu-ssŭ-t'a-yü* must also be investigated in the light of examples of transliteration.

According to the Toyo Bunko copy, the ideograph 木 (mu) is used to stand for *mu* as in the case of 木石克 *mu-shih-k'o* for *mushk*=shê 麝 (musk) 木石忒 *mu-shih-t'ê* for ch'üan 拳 (fist), and 洗木兒額 *hsi-mu-êrh-ê* for *sīmurgh*=fêng-huang 鳳凰 (Chinese mythical bird); and sometimes for *m* as in the case of *ya-mu-ha-na* 呀木哈納 for *yām khānah*=kuan-i 館驛 (post-station house). As to 思 (ssŭ) the same book gives 羅思他 *lo-ssŭ-t'a* for *rostā*=ts'un 村 (village), 得思忒 *tê-ssŭ-t'ê* for *dast*=shou 手 (hand), 他屋思 *t'a-wu-ssŭ* for *ṭā'us*=k'ung-ch'iao 孔雀 (peacock), 法奴思 *fa-nu-ssŭ* for *fānūs*=têng-lung 燈籠 (hanging

lantern), showing that either at the middle or at the end of a word 思 (ssŭ) is always pronounced *s*. No example is found in which 思 (ssŭ) occurs at the beginning of a word. 塔 (t'a) which has the same pronunciation as t'a 他, occurs in the Toyo Bunko copy always as *tā* (*ṭā*) at any position of a word, as in the case of 他屋思 for *ṭā'us* 孔雀 (peacock), 他列克 *t'a-lieh-k'o* for *tārik*=an 暗 (dark), 洗他勒 *hsi-t'a-lê* for *sitārah*=hsing 星 (star), 羅思他 for *rostā*=村 (village). So it would not be wrong to take 塔 (t'a) here also to have this sound or its shorter sound. On the other hand, as 答, 搭, (ta) which resemble 塔 (t'a) represent *dā* according to the Toyo Bunko copy, as in the case of 別搭兒 *Pieh-ta-êrh* for *bīdār*=hsing 醒 (awake), 膽搭恩 *tan-ta-ên* for *dandān*=ya 牙 (teeth), and according to the Awa Library copy as in the case of 法兒答 *fa-êrh-ta* for *fardā*=ming-jih 明日 (to-morrow), and 掃答 *sao-ta* for *saudā*=mai-mai 賣買 (bargain), one may suspect the same pronunciation in the case of 塔 (t'a). However, in view of the overwhelming majority of words in the Arabic and Persian words (especially those derived from Arabic words) in which the three consonants *m*, *s*, and *t* occur, over against the words in which *m*, *s*, and *d* occur, this suspicion will have no proper ground. So it would be almost evident that the word now sought for had at least the sound *musta*. And for this same reason, it would be inferred that the word in question was probably the participle (adjective) of the tenth form derived from an Arabic verb or the participle (adjective) of the eighth form derived from an Arabic verb with the *s* sound at its beginning. In order to render the point still more decisive, it would be necessary to investigate the transliteration of 餘.

The modern pronunciation of 餘 is *yü*, but as the present writer is unable to offer a case in which this word gives the pronunciation of a Persian or an Arabic word, of which the meaning and pronunciation have been accurately handed down, he will adopt the examples of 迂 (yü) which has the same pronunciation as 餘 and thereby demonstrate the point indirectly. This is not an example from the Yüan dynasty, but in the Toyo Bunko copy frequently quoted, *yūz*, originally a Turkish word meaning 'a leopard', is transliterated by 迂子 *yü-tzŭ*, *yū* being represented by 迂. Moreover, in the same book, 迂 at the end of a word is used for *wī*. Under *T'ung-yung-mên* 通用門 *qawī*, the Persian word for ch'iang 强 (strong) is transliterated by 改迂 *kai-yü*; and under *Shih-ling-mên* 時令門, for the Chinese word shui-tsai 水災 (flood), *āfati samāwī* (literally, 'disaster') is given and transliterated *a-fa-t'i-sai-ma-yü* 阿法梯塞媽迂. And in the Awa Library copy the ideograph 郁 with the same pronunciation is used for transliterating both *yū* and *wī*. From these examples of 迂 and 郁, it may be asserted that 餘 may also be used in transliterating *yū* and *wī*. So 木思塔餘 would suggest either *mustayū* or *mustawī* as its original word and is in such form as should at any rate be regarded as an Arabic originally, and a participle of the tenth form would not reconcile with the order of the consonants.

Should 木思塔餘 be taken as *mustayū*, is there any such word? No, none

is found in a dictionary. This kind of the ending of a word sounds so strange in this language that it is natural that no such word should exist. Now, what about the other word *mustawī*? A dictionary gives this word as meaning, 'be equal, in a straight line, straight line, straight, level, horizontal', and the noun *mustawā* means 'point of reference, level point, horizontal spot'. And it has become evident that this word is the active participle of *istawā*, the eighth form of the Arabic verb *sawiya* meaning 'be valuable, make level'. There are other words meaning 'horizontal, plane' such as *masṭī*, *mustasauwī*, *mustasawī*, *masattah*; but so long as the transliteration 木思塔餘 is credited, *mustawī* must be regarded as the most suitable form.

If 魯哈麻 or *rukhāmah* means 'a horizontal sun-dial' and 木思塔餘 or *mustawī* means horizontal, plane, the words seem to be tautological in meaning and at a glance unreasonable. Perhaps because the former was used simply in the meaning of a sun-dial, addition of an epithet descriptive of its attribute was considered necessary. As already supposed, the explanation of this astronomical instrument somehow gives an impression that it might have been a vertical sun-dial. Nevertheless, *mustaqīm* and other words meaning 'vertical' would not suit 木思塔餘, and so long as *rukhāmah* itself is a horizontal sun-dial, further investigation of this word must wait for another occasion.

If the above interpretation should not be wide of the mark, the original pronunciation of 魯哈麻亦木思塔餘. 漢言冬夏至晷影堂 under (4) would be *rukhāmah-i-mustawī* meaning 'a horizontal sun-dial'. As this kuei-ying-t'ang 晷影堂 (sunshine stall) was valued in observing the points of the winter and summer solstices, the name 冬夏至晷影堂 (sunshine stall for winter and summer solstices) was probably adopted.

The names of the four out of the seven instruments have roughly been interpreted. The next item which it seems possible to solve in a similar way though the manner of transliteration seems different from that adopted previously in the case of the names of the four instruments, would be *tsa-t'u-ha-la-chi* 咱禿哈剌吉, in Chinese *hun-t'ien-i* 混天儀 under (1) and *tsa-t'u-shuo-pɤ-t'ai* 咱禿朔八台, in Chinese *ts'ê-yen-chou-t'ien-hsing-yao-chih-ch'i* 測驗周天星曜之器 under (2). Though translated into Chinese under (1) as *i* 儀 (instrument) and (2) as *ts'ê-yen-ch'i* 測驗器 (observation instrument), the two ideographs *tsa-t'u* 咱禿 are adopted for transliterating them both; it definitely proves the identity of the original words. 咱 has at present the two sounds *tsa* and *tsan*; and the *Chu-shih-i-yü-chieh-i* 諸史夷語解義, in the possession of the Seika-dō 靜嘉堂 Library, manuscript of the Ch'ing dynasty, compiled by CH'ÊN Shih-yüan 陳士元 of Ying-ch'êng 應城, says 咱音儹又音捐 (咱 pronounced *tsan* or *chüan*) as if the ideograph had another pronunciation *chüan* in addition to the above two pronunciations. Was it really so? If one investigates the examples of transliteration in the books of the Yüan, Ming, and Ch'ing dynasties, the use was naturally limited. The *Yin-shan-chêng-yao* 飲膳正要 by Hu-ssŭ-hui 忽思慧 of the Yüan dynasty gives *tsa-fu-lan* 咱夫蘭 for the Persian name *za'frān*; the

Awa Library copy dated the Ming dynasty transliterates *pa-tsa-êrh* 把咱兒 for *bāzār*=shih 市 (market), *ko-tsa-an-tê* 革咱安得 for *qaẓāghand*=ko 革 (leather); and the Toyo Bunko copy has *t'ê-ko-tsa* 忒噶咱 for *taqāẓā*=ts'ui 催 (hold), *yin-t'i-tsa-êlh* 尹體咱兒 for *intiẓār*=têng 等 (looking out for, expecting); the *T'ien-fang-tien-li-tso-yao-chieh* 天方典禮擇要解 by Liu Chih 劉智 compiled during the *K'ang-hsi* 康熙 era of the Ch'ing dynasty, gives for *mo-tsa-hsi-pu* 墨咱吸卜 = chiao-lei 教類 (sect, school) which is most probably the transliteration of *maẓāhib*. Judging from these examples, it may be said that as the ideograph stood for *za*, *ẓa*, *ẓa*, *ẓa*, and their long sounds, *tsa* was the sound used more frequently than *chuan* or *tsan*.

What about 禿 (t'u) then? The Awa Library copy gives 禿 for *tū*=ni 你 (you), *t'u-hên* 禿恨 for *tukhm*=tzŭ-chung 子種 (seed); while the Toyo Bunko copy transliterates *su-t'u-ên* 速禿恩 for *sutūn*=chu 柱 (pillar), *min-ta-t'u* 敏塔禿 for *mindātū*=mien 綿 (cotton); so it follows that 禿 was used only for *tu* or *tū*. The words suggested by the two ideographs 咱禿, then, are zātū zātu zatū, zatu, or the various forms of these words with the consonant *ẓ*, *ẓ* and *ẓ* in the first syllable: and as the vowel at the beginning of a word is often omitted or left out in transliterating it into Chinese, these words prefixed by such vowels as *a*, *i*, and *u* must be considered. On referring to a dictionary, one may find a word which coincides with words of the above-mentioned forms, but not one which may mean an instrument or apparatus which corresponds to 儀 (instrument) or 測驗器 (observation instrument) recorded in the *T'ien-wên-chih*. Compelled to look for a word somewhat resembling the sound of this transliteration and satisfying the meaning of the Chinese translation, one may adopt the modern Arabic *adāt* which means 'instrument, apparatus'. This word would seem to fit both (1) and (2) in meaning at least. For the ideograph 儀 under (1) may be interpreted to refer, not to a globe, but to an instrument used as a rule in measurement, as shown by the explanation in the *T'ien-wên-chih*, which will be given later. So it follows that 測驗之器 (an instrument used in measurement) under (2) is correct. And *adāt* which must be a subject in the Arabic language as will be discussed later, should read *adātu*, and this may be a more accurate form for the transliteration. As *d* and *ẓ* are often interchangeable in Arabic and Persian probably because of the resemblance of the two letters in appearance, *aẓātu* may have been another pronunciation in those days.

As for the transliteration, it is true that the sound *dā* was never transliterated by 咱 in the examples the writer has investigated, but a reason may be offered for the possibility of transliterating *dā* with 咱. The *t* sound is a voiceless dental stop while *ṭ* is, though also a dental sound, a voiceless emphatic consonant. Now, these two sounds are scarcely distinguished in Chinese transliteration. For instance, the Toyo Bunko copy gives *t'ê-pi-pu* 忒必卜 for *ṭabīb*=*i* 醫 (medical man), *pai-t'ê* 白忒 for *baṭ*=ya 鴨 (duck),—thus representing *ṭa*, *ṭ* by 忒, while the same book gives *t'ê-ê-li-yin* 忒額里尹 for *taghrīm*=fa 罰 (punishment), and

yin-sa-ni-yeh-t'ê 因撒你夜忒 for *insānīyat*=jên 仁 (humanity)—thus representing *ta*, *t* with the same ideograph. This happens because in Persian there is no distinction between *t* and *ṭ*, and the ideographic distinction is ignored. It need not be pointed out with examples that in Chinese transliteration *l* and *r*, the two consonants produced by the tip of the tongue are not distinguished by different ideographs, except a few specified ideographs transliterate *r*. And among guttural sounds, *q* and *ḳ*, *h*, *ḥ* and *kh*, *'a* and *gha* which, though among the gutterals alike, could be minutely differentiated, are apparently confused in Chinese transliteration. In comparing such examples with the issue in question,—that *d* is a voiced close consonant of the front palate, while *ẓ* is an emphatic close consonant of a similar nature, and *ẓ* is also something like it, one may recall that, in the previous examples of transliterating with 咱, *ẓ* and *ẓ* were transliterated by 咱 as in *intizār*, *qāẓāghand*. Consequently, though not proved that there were *aẓāt*, *aẓāt*, or *aẓāt* (previously considered) as ancient forms of the present *adāt*, it may be argued that *adāt* was so corrupted in pronunciation that the ideograph 咱 which originally did not represent *dā* somehow came to represent *dā* (*adā*). This is not the only case in which corruption and colloquialism should not be overlooked in handling the transliteration of foreign words.

Now, as for *ha-la-chi* 哈剌吉, the latter half in the phrase *tsa-t'u-ha-la-chi* 咱禿哈剌吉, faithfulness to the transliteration could not lead to any word that means Hun-t'ien 混天 (the whole heaven) either in modern Arabic or in Persian. 哈 (ha, k'a) which occurs in transliteration too frequently to need many citations is used in transliterating *ha*, *hā* as in the case of *chê-ha-ên* 者哈恩 for *jahān*=shih 世 (world) and *ha-lê* 哈勒 for *halah*=yüeh-yün 月運 (halo of the moon), *ḥā* (*ḥa*) as in the case of *mu-ha-ko* 母哈革 for *muḥāq*=ts'an-yüeh 殘月 (waning moon), and *khā* (*kha*) as in the case of *ha-k'o* 哈克 for *khāk*=t'u 土 (earth). The above instances are all taken from the Toyo Bunko copy. 剌 (la) is almost always used in transliterating *ra* and *la*, especially their longer sounds. It would need no examples. 吉 (chi) is used in transliterating *gh* (*ghi*, *ghī*), *gi* (*gī*) as in the case of *chi-lê* 吉勒 for *gil*=ni 泥 (mud) in the Toyo Bunko copy, and as in the case of *t'u-chi* 土吉 in the Awa Library copy, and *t'u-chi* 土几 in the Toyo Bunko copy for *tūgī*=mi 米 (rice), and *pa-chi-ta* 八吉打 for Baghdād in the *Yüan-shih*. Only 八吉打 in the *Yüan-shih* was no doubt a transliteration of Baghidād, the Persian name for the city, not one of the Arabic pronunciation.

The 哈剌吉 as a transliteration never occurs outside the *T'ien-wên-chih* of the *Yüan-shih*, but *a-la-chi* 阿剌吉, a word which resembles this to a considerable extent, is found in the following passage in the *Ta-ming T'ai-tsu-shih-lu* 大明太祖實錄 (Vol. 79) under the day of *Kêng-ch'ên* 庚辰 (7th), the 2nd month, the 6th year of *Hung-wu* 洪武.

"The Mohammedan sea-trader presented to the court a foreign perfume called 阿剌吉. 阿剌吉 is *ch'iang-wei-lou* 薔薇露 (rose-dew) in Chinese. He

said that the perfume would cure ills of the human heart and also, if powdered, would serve as a facepowder for women. The Emperor answered 'China has a number of remedies for human illness. This will be used only as a toilet material, and will lead to extravagance.' So he did not accept the present."(1) The present of the Mohammedan sea-trader to the court was called 阿剌吉 or 薔薇露 (rose-dew) in Chinese. The same transliteration occurs in the following passage in the *Liao-tung-chih* 遼東志 (Vol. 9) under Chêng-nü-chih 生女直 (barbarous Jurchen): 每聚會, 人持燒酒一魚胞, 俗名阿剌吉, "Whenever the people assemble, each brings a burning wine and fish. This burning wine is commonly called 阿剌吉." This is a transliteration of *araki* in Manchurian, Goldi, Turkish, and Mongolian, *aražan* in the Teleut language, and also *arak*, or *araka* in Turkish, Mongolian, and Manchurian.(2) Should then, 阿剌吉 in the *Ta-ming-shih-lu* 大明實錄 be taken to mean the identical article? By consulting dictionaries, one will find the word *'araq* in Arabic and Persian, which means 'sweat, liquid, sap, milk, a liquid containing a high percentage of alcohol, and alcohol itself.' Seeing that it is also recorded that it is called 薔薇露 (rose-dew) in Chinese, and also explained as fan-hsiang-a-la-chi 番香阿剌吉, the transliterations could not be taken as identical too hastily. To begin with, the study of the Chinese phrase, the common Arabic and Persian for 薔薇露 (rose-dew) is *gul-āb* (rose-water). *Ku-la-pu* 古剌卜 for 薔薇花 (rose-flower) in the Awa Library copy and 古剌卜 for 薔薇 (rose) in the Toyo Bunko copy must be the transliteration of this word *gul-āb*. On the other hand *'araq* may be also used in forming a word of a similar meaning. It is *'araqi gul* (rose-juice), a phrase containing *'araq* as in the case of *'araqi shakar* (sugar-water), *'araqi chīn* (a kind of perfume), and *'araqi bahār* (perfume taken from citrus fruit).(3) *I* in the phrase *'araqi* is an *i* added as izāfa. If the 阿剌吉 in the *Liao-tung-chih* is a transliteration of *araki*, a Manchu word, the 阿剌吉 in the *Ta-ming-shih-lu* should be taken as *'araqi*, an abridged form of *'araqi-gul*. So it has been proved that 吉 was also used in transliterating *ki* (*kī*), *qi* (*qī*).

哈剌吉, a phrase almost identical with 阿剌吉, in the light of the above standpoint, would seem to belong to one of the various words, for instance, *haraki* composed of various sounds above-mentioned, but it has been found impossible to find a word in such form meaning *hun-t'ien* 混天 (the whole heaven). The only word in modern Arabic or Persian, resembling 哈剌吉 in pronunciation and meaning 'the whole heaven', would be *falak* or *aflak* (pl. form), which was originally Arabic. This word means 'the firmament, the sky, the orbit of the heavenly bodies, a globe'. The *T'ien-wên-chih* in the *Yüan-shih* comments on (1) as follows:

(1) 海實回回, 以番香阿剌吉爲獻. 阿剌吉者, 華言薔薇露也. 言, 此香可以療人心疾, 及調粉爲婦人容飾. 上曰, 中國藥物, 可療人疾者甚多. 此特爲容飾之資. 徒啓奢靡. 不受.

(2) K. SHIRATORI, *Saiiki-shi Kenkyū* 西域史研究 (A Study of the History of the Western Regions), Vol. I, p. 105

(3) STEINGASS, *A Comprehensive Persian-English Dictionary*, p. 884.

"As for its construction, it is made of copper. A single ring is installed horizontally. On it are engraven the degrees of the whole heaven with the positions of the 12 constellations of the zodiac marked in conformity with the level of the earth. A subsidiary double-ring is erected and fastened north and south to the horizontal ring, and the lower half is buried in the ground. By this the degrees of the heaven are divided. The second inner double-ring is also engraven with the degrees of the whole heaven. They intersect each other, and are thus fastened to the subsidiary double-ring. 36 degrees from the horizon, represent the north and south poles. It can be revolved to represent the movement of the heavenly bodies and be used as the orbit of the sun. The third and fourth inner rings are both fastened to the second ring. They are 24 degrees apart from the north and south poles. They can also be revolved. The three movable rings facing each other are fastened with square nails of copper, which all have holes which take the place of 衡簫 *hêng-hsiao* or the ancient measurement tubes for making observation."(1)

It is thus evident that (1) was intended for observing the movement of the heavenly bodies, and *falak* or *aflak* may be most likely the word for the present purpose. Now as to 哈, 合 (*hap* according to ancient pronunciation) originally of the same pronunciation as 哈 has been used for transcribing *alp* a Turkish word meaning 'bravery.' Though the writer has not succeeded in finding a case of a *f* sound transcribed with 哈; yet if the close relation between *p* and *f* is considered, and some carelessness on the part of transcribers is admitted, this letter could not be flatly rejected. Therefore, the present writer is of the opinion that the original of 咱禿哈剌吉 should be determined as *Adātu falaki*. The formation of this phrase being Arabian, *u* at the end of *adātu* indicates the nominative case and *i* at the end of *falaki* the possessive. It is true, *aflaki* (the plural form) as well as *falaki* may be adopted; but the singular form has been adopted in consideration of the tone quality of 哈 and the above examples of transcription. 混天儀 was, of course, Hun-t'ien-i 渾天儀 (a celestial globe).

The next point of investigation will be (2) *tsa-t'u-shuo-pa-t'ai* 咱禿朔八台, ts'ê-yen-chou-t'ien-hsing-yao-chih-ch'i 測驗周天星曜之器 in Chinese. 咱禿 being found out to be the transcription of *adātu* (nom. case) and refers to an instrument for measurement, it follows that 朔八台 means the stars moving through the heaven.

Now, 朔 (shuo) being of the same pronunciation as *shuo* 搠, the examples of these two letters will be cosidered. The Toyo Bunko copy gives *shuo-êrh* 朔兒 (搠兒 in the Awa Library copy) for *shor*=hsien 鹹 (salt), *shuo-êrh-pu* 朔兒卜 (*shuo-êrh-pa* 搠兒巴 in the Awa Library copy) for *shorba*=t'ang 湯 (soup, broth),

(1) 其制以銅爲之. 平設單環, 刻周天度, 畫十二辰位, 以準地面. 側立雙環, 而結於平環之子午, 半入地下, 以分天度. 內第二雙環, 亦刻周天度, 而差相交, 以結于側雙環. 去地平三十六度, 以爲南北極, 可以旋轉, 以象天運, 爲日行之道. 內第三, 第四環, 皆結於第二環. 又去南北極, 二十四度, 亦可以運轉. 凡可運三環. 各對綴銅方釘皆有竅, 以代衡簫之仰窺焉.

shuo-i 朔衣 (*shuo-i* 搠亦 in the Awa Library copy) for *shūy*=fu 夫 (husband), *shuo-pu* 搠卜 (the same in the Awa Library copy) for *chūb, chob*=mu 木 (tree). This shows that, no matter how it was used in transcribing other languages, in transcribing Arabic and Persian words, 朔 was used for *sho, shū* (*chū, cho*), 八 (pa) was generally read *ba* (*bā*), sometimes *pa* (*pā*); 台 (t'ai) usually *tai, tei* during the Yüan dynasty. There being a number of examples for these two letters and comparison being simple, examples are omitted here. As 台 was pronounced *tai, tei*, it may be admitted to have stood for *ti, tī* slightly shifted in pronunciation.

The above being examples of 朔, 八 and 台 used in transcription the original to be imagined from them would be a word composed of the three consonants *sh* (*ch,*) *b* (*p*), and *t* (*ṭ*) and meaning the stars of the whole heaven. Phonetically, *sh, ch* might be replaced by similar fricatives, such as *s, ṣ, ṣ́, z, ẓ*. From such a broad standpoint, a likely word close to 朔八台 in pronunciation and suitable in meaning could be obtained. Under *T'ien-wên-mên* 天文門 in the Toyo Bunko copy gives *Sa-pi-t'a-tê* 撒比他忒 for ﺳﺎﺑﺘﻪ=tsa-hsing雜星. The pronunciation of this original word must surely be *ṣābitāt;* and its ending being *āt,* it must be taken to be in the plural form of an Arabic feminine noun; and its singular form originally must have been *ṣābitat. Ṣ* is a voiceless dental fricative like *th* in *think, thought* in English, and so extremely rare in proper Persian, as may be seen by referring to a dictionary, that nearly every word in Persian vocabulary with this sound at the opening may be asserted as one of Arabic origin. The above examples would show that, judging at least from the Chinese transcriptions, *s* and *ṣ* were scarcely differentiated in pronunciation. For 撒 (sa) cited here, as will be dwelt upon later, except when mistaken for 散 (san) and used for *san,* has always been used for *sa, sā.* Since the present writer has not been able to find a word containing *ṣ* except the single one above-cited, either in the Toyo Bunko copy or in the Awa Library copy, he is not in a position to claim more. However, confusion of *s* and *ṣ* would seem probable exactly as in the case of *t* and *ṭ*.

Ṣābitāt originally derived from the Arabic *ṣabata* (to stand firm, fix, confirm, resolute) is an adjective meaning 'unmoving, permanent, firm, constant.' So it refers to unmoving stars or the fixed stars. STEINGASS's Persian-English dictionary does not give *ṣābitāt,* but contains *ṣawābit,* the plural form of *ṣābitāt.* And *ṣabāt* originated from the same source means 'firmness, constancy, permanence, stability, security, fortitude, perseverance,' while *ṣabt* means 'unchanged, decided.' From the above examples, *ṣabāt* would seem to be the most suitable, but as no dictionary ascribes to it the meaning of unmoving star, *ṣawābit* one of the plural form of *ṣābitat* should be adopted in spite of some irreconcilability with the transcription. And 八 in the transcription is perhaps for *wa,* not for *bi.* Though no example of 八 representing *w* (*v*) is yet known, *w* and *b* are interchangeable; and the stress of the *wa* sound in this word would tend to suggest it, or phonetically speaking, the initial syllables *ṣawā* being slurred to

be *ṣā*, the word somehow came to be corrupted to *ṣābat*. That the Chinese translation *tsa-hsing* 雜星 referred to the fixed stars in the heaven would be evident by consulting 說雜星性情 (Explanation of the functions of miscellaneous stars) under *Ti-pa-mên* 第八門 in *Ti-i-lei* 第一類 in the *Hui-hui-t'ien-wên-shu* 回回天文書 translated in the Ming dynasty. The *Shih-yung-po-hua-tz'ŭ-tien* 實用波華辭典 (A Practical Persian-Chinese Dictionary) edited by CHANG Ch'ien 張謙 translates *ṣawābit* as *hêng-hsing* 恒星 (fixed stars). And the Toyo Bunko copy which contains the word *ṣābitāt*, apart from the word 雜星 records *saiyārāt*, an Arabic word originally meaning 'planets' for the *ch'i-chêng* 七政 (seven stars) which refer to the sun, the moon and five other planets. This proves that 雜星 referred to fixed stars.

The above investigation has shown that the original of 咱禿朔八台 was *adātu ṣawābiti* (the final *i* indicating the possessive case) namely, "the instrument for (observing) the fixed stars," that the Chinese translation 測驗周天星曜之器 (the instrument for observing stars of the whole heaven) conveys the original meaning fairly well, and that the very form of the word proves the fact that the original form of the Arabic was preserved entire and included in the Persian vocabulary. The construction is explained in the *T'ien-wên-chih* as follows:

"A round fence surrounds the premises, and a gate is cut on the eastern side. Within there is a small stand. A copper table is erected. The height is 7 *chih* 5 *ts'un*. Upon it a shaft is installed with a copper measure hung. The length is 5 *chih* 5 *ts'un*. Also two tubes (*hsiao* 簫) for looking through are added. The length is the same as the former. Under it a lateral measure is placed, with degrees engraven on it. By means of this it is adjusted in accordance with the distance from the fundamental map below the overhung measure. It may be thus turned to left and right for observation. By means of this it may be raised or lowered to enable the operator to observe in any direction."(1)

The writer is now convinced that the above six instruments have been made fairly clear by applying about a similar method.

Now as to the last item *Wu-su-tu-êrh-la-pu-ting* 兀速都兒剌不定, *Chou-yeh-shih-k'o-chih-ch'i* 晝夜時刻之器 in Chinese what is the true character of this instrument?(2) The phrase 兀速都兒剌不定 in the *Yüan-shih* regarded as a transcription must be read *wu-su-tu-êrh-la-pu-ting* in modern pronunciation. The reading of these letters excepting the last one 定 would at once remind the reader of the astrolabe, an astronomical instrument used in measuring the altitudes of heavenly bodies and calculating times and latitudes. And the explanation in the *T'ien-wên-chih* would all the more confirm the reader of the

(1) 外周圍墻，而東面啓門. 中有小臺，立銅表. 高七尺五寸. 上設攙軸，懸銅尺，長五尺五寸. 復加窺測之簫二. 其長如之. 下置橫尺，刻度數其上，以準掛尺下本開圖之遠近，可以左右轉而周窺. 可以高低擧而徧測.

(2) E. ZINNER took this to be a '*Wasseruhr*' (*op. cit.*, p. 236). It must be said that his decision was reached by entirely ignoring the original word or the explanation in the *T'ien-wên-chih* of the *Yüan-shih*.

supposition. The *T'ien-wên-chih* of the *Yüan-shih* explains the structure and function of the instrument as follows:

"As for its construction, it is made of copper. It it like a round mirror which may be hung. On the surface, the 12 constellations of the zodiac and hours of day and night are engraven. Over it a copper wire is added, and is thrust through its centre for the purpose of revolving it. The ends of the copper wire are each bent to form two holes facing each other. During the day the sun-beam is observed, while during the night stars are watched for determining hours, and for foretelling fortune. On the back three small mirrors are inserted and seven maps in all are engraven. By this instrument one will find the four cardinal points of the compass, difference in lengths of sun-beams, and change in the movements of the stars. Therefore, each has a different map of its own for observing all phenomena of heaven and earth."(1)

If this is read carefully, the instrument in question is no doubt the astrolabe or "an ancient disc-like measurement instreument." Now, this astronomical instrument was a Greek instrument invented by HIPPARCHUS in the middle of the 3rd century B. C. or by APPOLLONIUS of Perga of the same period.(2) This is one of the oldest scientific instruments in the world which enjoyed practical use until the middle of the 18th century and has received high appreciation in the history of civilization. The high position it occupied in Islam world a glance at the scientific history of Saracen will readily show. A study of the catalogue of Islam bibliographies collected by Europeans will tell the large number of works on this instrument and also the tremendous interest they had as to its construction and use.(3) The original Greek name was *αστρόλαβον*, and the Latin name *astrolabium*. Of what language was the original word transcribed with the Chinese ideographs which occur in the *T'ien-wên-chih* of the *Yüan-shih?* As this instrument went west and east from Greece, the original Greek name was somewhat modified in each country into which the instrument was introduced. It was the same with Arabia and Persia; in the former it was pronounced

(1) 其制以銅，如圓鏡而可掛. 面刻十二辰位，晝夜時刻. 上加銅條，綴其中，可以圓轉. 銅條兩端，各其首，爲二竅以對望. 晝則視日影，夜則窺星辰，以定時刻，以測休咎. 背嵌鏡片三面，刻其圖凡七. 以辨東西南北，日影長短之不同，星辰向背之有異. 故異其圖，以盡天地之變焉.

(2) *cf. Encyclopaedia Britanica*, the article on the astrolabe.

(3) For instance, consult the following manuscript bibliographies. *Descriptive Catalog of the Garrett Collection of Arabic Manuscripts in the Princeton University Library*, by Philip K. HITTI, Nabin Amin Faris, Butrus Abdal-Malik, 1938, Princeton, London. *Bibliothèque nationale, Catalogue de la collection de manuscrits orientaux arabes, persans turcs* formée par M. Charles SCHEFER et acquie par l'État, publié par E. BLOCHET, 1900, Paris. E. BLOCHET, *Catalogue des manuscrits persans, bibliothèque nationale,* 2 toms, 1905–12, Paris. A.G. ELLIS, *Catalogue of Arabic Books in the British Museum,* 2 vols. 1894, London. M. Th. HOUTSMA, *Catalogue d'une collection de manuscrits arabes et turcs,* Leiden. E. G. BROWNE, *A Catalogue of the Persian Manuscripts in the Library of the University of Cambridge,* 1896, Cambridge. Ch. RIEU, *Catalogue of the Persian Msnuscripts in the British Museum,* 3 vols. 1879–83, London.

iṣṭārlāb, and in the latter *usturlāb*, *uṣṭurlāb*, *usṭurlāb*. Though spelt thus in three ways in Persian, it seems that the pronunciation may be unified to *usturlāb*. For in Persian *t* (a voiceless dental occlusive) and *ṭ* (an emphatic voiceless dental occlusive) are not differentiated, and in the same way *s* (a prepalatal fricative) and *ṣ* (an emphatic prepalatal fricative) are not distinguished. It is evident that the transcription in the *T'ien-wên-chih* of the *Yüan-shih* was not based on the Latin name, but whether the original was *αστρόλαβου* the Greek, *iṣṭarlāb* the Arabic, or *usturlāb* the Persian could be settled solely by a study of what is transcribed by the ideograph 兀. This letter which is generally used for *wu* in transcription, almost always stands for *u*, and on rare occasions for *γu*, being accompanied by a weak consonant *γ* as in 畏兀兒 (wei-wu-êrh) for *Uiγur*. But the present writer has found no case in which it is used for *a*, or *i*. As it is possible to grasp the exact pronunciation of the original word, a few examples will be picked up from the *Hua-i-i-yü* 華夷譯語. The original word for *wu-mu-êrh* 兀木兒=shou 壽 (age, life-time) recorded in the Toyo Bunko copy must be *'umur*, and it is transcribed as *wu-mu-êrh* 兀母兒, in the Awa Library coyy. Under *T'ung-yung-mên* 通用門, the Toyo Bunko copy gives t'ê-fa-wu-t'ê 忒法兀忒 for *i* 異 (difference)—this is the only exception in the book, in which five successive words including this present one are recorded without the corresponding original words for them—which must be the translation and the transcription of *tafāwut*. The Awa Library copy gives *wu-shih-t'u-êrh* 兀失禿兒 evidently for *ushtur*=t'o 駝 (camel), *t'a-wu-ssŭ* 他兀思 for *tā'us*=k'ung-ch'iao 孔雀 (peacock), and *ka-wu* 嘎兀 which must be a transcription of *gau*, one of the words *gāu*, *gāo*, *gāv* which all mean niu 牛 (ox, cow). In the light of these examples, the word in question beginning with the letter 兀 must have been, not *αστρόλαβου*, nor *iṣṭarlāb*, but *usturlāb*, the Persian word. It goes without saying that 都 is a happier letter for representing *tu* (*ṭu*) far better than a mere consonant such as *t* or *ta* (*ṭa*).

The above, however, has not completely solved (7). The final letter 定 reserved heretofore must somehow be disposed of. Reference to dictionaries has shown that *iṣṭarlāb* and *usturlāb* are used as complete words, never suffixed by such a letter as 定 (ting). In Persian, a stand on which things are put is called *dān*. For instance, a lamp is *chirāgh*, and a lamp-stand is *chirāghdān* as is definitely proved by *ch'ê-la-ê-tang* 扯剌額當 for têng-chan 燈盞 (lamp-stand) included in the Awa Library copy. But there 當 (tang) is used for transcribing *dān*. The Awa Library copy gives tan-tang 膽當 as the transcription for the word meaning 'tooth'; it must be for the original word *dandān*. May 定 (ting) also mean a stand on which things are put? First, it seems, as previously stated, that there is no word with a suffix added to *usturlāb*. Further, it seems difficult to represent *dān* with *ting* as in the case of 當 (tang). As the Toyo Bunko copy gives *mu-a-ting* 母阿定, for *ma'adin*=kung 鑛 (ore), 定 is a proper letter for transcribing *din*, as incidentally proved by the examples of 丁 pronounced like it and always used for *din*, *dīn*. Therefore, it is impossible to

connect 定 with 兀速都兒剌卜 to form one correct phrase. Should the letter be struck off, then? No, the writer would rather place it below han-yen 漢言 and read the phrase as *Ting-chou-yeh-shih-k'o-chih-ch'i* 定晝夜時刻之器 (an instrument for determining hours of day and night), because a function of the *usturlāb* or astrolabe was to determine hours, and as the account in the *T'ien-wên-chih* says:

"During the day the sun-beam is observed, while during the night stars are watched for determining hours, and for foretelling fortune."(1)

Should the foregoing include few errors, fortunately, the correct names of the seven Islam instruments would be as follows:

1.	咱禿哈剌吉	Adātu falaki
2.	咱禿朔八台	Adātu ṣawābiti
3.	魯哈麻亦渺凹只	Rukhāmah-i-muwāzī
4.	魯哈麻亦木思塔餘	Rukhāmah-i-mustāwī
5.	苦來亦撒麻	Ku(r)rah-i-samā'
6.	苦來亦阿兒子	Ku(r)rah-i-arẓ
7.	兀速都兒剌卜定(2)	Usturlāb

It has been proved that all these were, originally, Arabic words or foreign words which had once been absorbed into the Arabic language; yet when they were introduced into Chinese during the Yüan dynasty, nearly all of them had been Persianized. This should not be made light of only because Jamāl ud-Dīn was a man of Iran origin. It should be taken as a fact which eloquently bespeaks that, with the inflow of the Arabic language into the Persian, Arabian science in Iran at that time tended to Iranization. What characteristics and originality these seven instruments attributed to Jamāl ud-Dīn had in themselves, and what a position they deserved in the history of Islam culture, especially in the history of its astronomy — this question will not be answered until the account in the *T'ien-wên-chih* of the *Yüan-shih* has been carefully studied, the construtions of the instruments and their functions inferred from it have accurately been grasped, and the instruments have been compared with those of the original Islam homeland, which must have been investigated by this time. The present writer would like to invite the astronomers of the world to undertake this laborious task.

III. The Original Names of Books and Instruments Recorded in the *Yüan-pi-shu-chien-chih.*

The writer's personal view at present on the Islam instruments recorded in the *T'ien-wên-chih* of *Yüan-shih* has been roughly presented in the foregoing. Now, along with this record, the account in the *Yüan-pi-shu-chien-chih* may be

(1) 晝則視日影，夜則窺星辰，以定時刻，以測休咎.

(2) The letter 定 as investigated in the text, is not a transcription but a word which should come below 漢言 to form the phrase reading 定晝夜時刻之器.

a matter not to be overlooked as a material in the history of the eastern inflow of western culture. It was Prof. Mikinosuke ISHIDA that first pointed out this record and it was his article that called the writer's attention to the account in question. Before presenting his view, therefore, the present writer wishes to express his profound gratitude to Prof. ISHIDA and earnestly ask for his opinion. So far as the writer's knowledge goes, it was in Prof. ISHIDA's article entitled "Sō-Gen Jidai 宋元時代 (The Sung and Yüan dynasties)"[1] in at that time Prof. ISHIDA was of the opinion that the Chinese ideographs in the *Yüan-pi-shu-chien-chih,* which seemed to be the transcriptions of foreign words, placed over the names of the books and instruments in Chinese ideographs each represented the name of the author or the maker. However, in his article "Shina Bunka to Seihō Bunka to no Kōryū 支那文化と西方文化との交流 (Interflow of Chinese and Western Cultures)"[2] Prof. ISHIDA revised his former view, supposing these Chinese idegraphs to be transliterations in Chinese ideographs of the original words Arabic or Persian (p. 61); but he did not go further to offer the original words. The writer knows of no other scholar Japanese or foreign who has succeeded in identifying these transcriptions.

What, then, is the account in the *Yüan-pi-shu-chien-chih?* It is that occurs under Ssŭ-shu 司屬, Ssŭ-t'ien-chien 司天監. The portions concerned are as follows. Only the numeral for each heading is an addition by the writer; he has also left some space between the group of letters supposed to be the transcription and another supposed to be the translation as 麥者思的 造司天儀式十五部; the original book leaves no such space between the two groups of letters, giving the whole item in a group.

至元十年十月, 北司天臺申, 本臺合用文書.

"In the 10th year of *Chih-yüan,* the Northerh Observatory reported as to the books officially used by this Observatory."

經計經書二百四十二部

(Science-Books Officially Inspected, total 242 Items)

本臺見合用經書一百九十五部

(Science-Books officially used at present by this Observatory, total 195 Items)

(1) 兀忽列的 四擘算法段數十五部
(2) 罕里速窟 允解算法段目三部
(3) 撒唯那罕答者牙 諸般算法段目幷儀式十七部
(4) 麥者思的 造司天儀式十五部
(5) 阿堪 訣(決?)斷諸般災福 部
(6) 藍木立 占卜法度 部
(7) 麻塔合立 災福正義 部
(8) 海牙剔 窮歷法段數七部

(1) *Sekai Bunka-shi Taikei* 世界文化史大系 (Series of World Culture History), Vol. VIII, 1934, Seibundō Shinkō-sha 誠文堂 新光社.
(2) Tōyō Shichō 東洋思潮, No. 18, 1936.

(9) 呵些必牙 諸般算法八部
(10) 積尺 諸家歷四十八部
(11) 速瓦里可瓦乞必 星纂四部
(12) 撒那的阿剌忒 造渾儀香漏八部
(13) 撒非那 設(諸?)般法度纂要十二部
提點官家內諸般合使用文書四十七部
(Books of all kinds used at the house of the Superintendent, 47 Items)
(14) 亦乞昔兒 燒丹爐火八部
(15) 忒畢 醫經十三部
(16) 艾竭馬答 論說有無源流一十二部
(17) 帖里黑 總年號國名三部
(18) 密阿 辨認風水三部
(19) 福剌散 相書一部
(20) 者瓦希剌 別認寶具五部
(21) 黑牙里 造香漏幷諸般機巧二部
(22) 虵艾立 詩一部
(23) 兀速剌八个窟勒 小渾天圖
(24) 阿剌的殺密剌 測太陽晷影一個
(25) 牙禿魯 小渾儀一個
(26) 拍兒可兒潭 定圓方尺一個

Thus 23 items of books and 3 instruments are recorded here based on the report represented in the 10th month, the 10th year of *Chih-yüan* (1273 A. D.) by the Northern Observatory. 195 items of science books (13 branches) then used by the Observatory itself and 47 items used by the T'i-tien-kuan 提點官 (Superintendent of the Observatory), 242 items are given as the total number at the heading. Some of the books used by the observatory are not definitely reported by the number of titles, and this could be examined. But 47 given as the total number of titles assigned for the superintendent could not be correct. A study of the items shows that the books alone number 48 items (9 branches), and there are also one map and three instruments; and the books alone must reach 243. Pei-ssŭ-t'ien-t'ai 北司天臺 (the Northern Observatory), though a new name, must be the Hui-hui-ssŭ-t'ien-t'ai 回回司天臺. The term "northern" was probably adopted because the Hui-hui-ssŭ-t'ien-t'ai stood to the north of the Han-êrh-ssŭ-t'ien-t'ai 漢兒司天臺. Ti-t'ien-kuan, of course, referred to the Superintendent of the observatory. If the Northern Observatory mentioned here really were the Hui-hui-ssŭ-t'ien-t'ai, the T'i-t'ien-kuan (Superintendent) of the observatory in the 10th year of *Chih-yüan* was Jamāl ud-Dīn, as previously metioned in the account of his career.

Now, the method of discovering the original names in question, as in the case of the names recorded in the *T'ien-wên-chih* of the *Yüan-shih*, would be that of deducing the original words or words nearest to in meaning, resorting as far as possible to the letters conventionally used in transcription and avoiding

to make emendations with a biassed mind. To begin with, for the purpose of elucidating the general tone of these words, the handiest and simplest one will be interpreted first. The first one to be taken up is *t'ê-pi* 忒畢 transcribed 醫經十三部. The fact that i-ching 醫經 or the book of medicine is transcribed 忒畢 (t'ê-pi) will at once remind one of the Arabic word *ṭibb* meaning 'the medical art' and the Persianized words *tibb, ṭubb, ṭabb.* 忒畢 must no doubt be the transcription of one of these words. Which of the three is the most suitable for the transcripton? *Pi* 必 and *pi* 比 similary pronounced like 畢 are always used for *bi, bī* (mostly *bī* at the ending); so 畢 must represent the same sound or merely the consonant *b.* As all the three given here end in the same way, the wordending is out of the question. 忒 (t'ê) was so frequently used during the Yüan and Ming dynasties for transcribing foreign words few examples are needed here. The Toyo Bunko copy of that Ming dynasty, which gives the original words, always uses 忒 for *ta, ṭa. Mi-hei-t'ê-êrh* 米黑忒兒 for *mihtar*=kuei 貴 (nobler, greater), *t'ê-la-pi-tan* 忒勒比丹 for *talabīdan*=ch'êng 請 (inquire request), *t'ê-êrh* 忒兒 for *tar*=shih 濕 (wet), or otherwise for *t, ṭ* as *to-ssŭ-t'ê* 多思忒 for *dost*=ai 愛, (love) *pai-t'ê* 百忒 for *baṭṭ* (*baṭ*)=ya 鴨 (duck); and the only cases in which it uses the ideograph for *ti, tu* being *a-t'ê-shih* 阿忒石 for *atish*=huo 火 (fire), *fei-ssŭ-t'ê-ko* 非思忒革 for *fistuqī* (*fustuqī*)=liu-ch'ing 柳青 (of a pistachio, sea-green) among the 777 words included in the Toyo Bunko copy, furthermore, these two words being interchangeably pronounced *ātash, fastaq,* the book probably adopted the former way of pronunciation. Inferred from the above examples, the most probable word must be *ṭabb.* The fact that the Toyo Bunko copy gives t'ê-pi-pu 忒必卜 for *ṭabīb*=*i* 醫 (medicine) would provide a good reason for the assignment of *ṭa* for 忒. Then 忒畢 no doubt is a transcription of *ṭabb,* the Persianized word. Especially in the case of "the science of medicine," *'ilm-i-ṭibb* the very form *ṭibb* is used in the Persian language, but the writer finds no reason for changing the above-mentioned view.

One word has been solved as one somewhat partaking of the nature of the Persian language. For purpose of strengthening the ground, another word will be investigated. Let us take up 積尺, 諸家歷四十八部 under (10). From *chi-ch'ih* the present pronunciation of 積尺 two words *zīj* and *zīch* meaning "astronomical tables" may be sought. The former is a word in common with Arabic and Persian originated from the word *zīg*(1) while the latter is a genuine Persian word no doubt derived from the former.

Which would be the more suitable word for which the transliteration 積尺 stands? There is no doubt as to the pronunciation 積 stands for, as both words contain *zī* in common. Unfortunately, no example of 積 used in transcription is found, but as the ideograph *chi* 卽 which has the same pronunciation as 積 is generally used for *zī* in the Toyo Bunko copy as *chao-chi* 爪卽 for *jūzī*=ch'a-ko 茶褐 (brown), and *wo-chi-êrh* 我卽兒 for *wazīr*=ch'ên

(1) STEINGASS, *op. cit.,* p. 633.

臣 (minister), it is the very pronunciation needed here. Now as to the ideogaph *ch'ih* 尺 no example of the Yüan dynasty being found, examples of the Ming dynasty will be given from the *Hua-i-i-yü*. The Toyo Bunko copy and the *Hui-hui-kuan-piao-wên* 回回館表文 in the *Hsi-yü-t'ung-wên-piao* 西域同文表 in the possession of the Naikaku Bunko 內閣文庫 (the Cabinet Library of the Japanese Government) give in their Chinese translation of the report to the Court, *īlchī* as the Persian for envoy in the section where the names of envoys from various districts are recorded. This word *īlchī* seems to be a Turkish originally, but there is an example in which *yin-li-ch'ih* 引力尺 is used as an indubitable transcription for it. The Awa Library copy has 引力尺 for shih-ch'ên 使臣 (envoy) under *Jên-wu-mên* 人物門; the original of 引力尺 must be *īlchī*. *I-hêi-ch'ih* 以黑赤 for *īlchī*=shih 使 (envoy) in the Toyo Bunko copy must read *i-li-ch'ih* 以里赤, not 以黑赤. If so, 尺 like 赤 corresponds to *chī*. When the Awa Library copy gives *ch'ih-hsin-li* 尺欣力 for ssŭ-shih 四十 (forty), it is evident that it is the transcription of *chihil* which means 'forty.' And when the book gives *ch'ih-pu-ang* 尺卜昂 for tsao 棗 (jujube), it should not be taken as the precise transription of the present word *chabghān*, but as a word used at that time pronounced like *chibghān*, *chebghān*. In view of these examples, at any rate, the ideograph 尺 was always used for the *ch* sound, especially for *chi*, *chī*, but never for transcribing the *j* sound. If this tendency be extended to the Yüan dynasty, the word *zīch* which contains a *ch* sound in Persian, and never in Arabic might be preferred as one favoured with a superior condition. However, in ancient writings the letter *j* is used where it should be read *ch*; therefore, this conclusion should not be refuted on the mere strength of the letters adopted. The present writer is of the opinion that 尺 represented *chi*, *ch*, the final part of the word, and the *i* sound of iẓāfa combined into one word.

These two words chosen and interpreted merely because of their simple appearance have shown themselves as Persian or Persianized words. Encouraged by obtaining this ground, the origin of the other names will be investigated one after another.

(1) *Wu-hu-lieh-ti* 兀忽列的 Ssŭ-po-suan-fa-tuan-shu 四擘算法段數, (Theory of Geometry) Shih-wu-pu 十五部 15 Items

兀, as already proved, stands for *u*, *wu*, *'u*, *yu*. 忽, in most cases, is used for transcribing *kh*, *ḥ*, but may also be used for *q*, *k*. 列 should be taken to stand for *rī*, *le* (*re*, *lī*) as shown by the following examples in the Toyo Bunko copy: *T'ê-wa-lieh-hêi* 忒洼列黑 for *tawārikh*=shih 史 (history), *t'a-lieh-ko* 他列克 for *tarīk*=an 暗 (dark), *pai-lieh* 百列 for *bale*=shih 是 (this), *wo-lieh-ch'in* 我列欽 for *walekin*=jan 然 (but). The same book gives *ti-lê* 的勒 for *dil*=hsin 心 (heart), *pa-ti-sha-hêi* 把的沙黑 for *pādishāh*=chün 君 (lord); and some other books give examples in which the ideograph stands for other sounds, but generally it represents *dī*, not only from the above instances of transcription,

but also from a casual glance, this item was supposed to correspond to the famous "Elements of geometry" by EUQLID (EUCLIDES), and seems to be more and more confirmed. It is needless to say that in the Islam world, this book was already translated into Arabic in the earlier stage of the ʿAbbās dynasty, and had a considerable influence upon the study of mathematics. As he is invariably called UQLĪDIS اقليدس in the Islam world, the transcription under this item should have had such an ideograph as 思 representing the final *s* sound. The present writer is convinced that here such an ideograph is either omitted or left out. Islam literature on EUQLID is too abundant for citation. To mention only a few scholars of approximately the beginning of the Yüan dynasty, Muẓaffar al-Asfuzārī of the first half of the 12th century who wrote a comentary on the "Elements of geometry" by EUQLID,(1) Muẓaffar aṭ-Ṭūsī, an authority on the astrolabe and a profound scholar of geometry, dedicated a tentative treatise of postulates on EUQLID geometry to Nāṣir ud-Dīn aṭ-Ṭūsī(2), Ibn al-Lubūdī another scholar,(3) and Nāṣir ud-Dīn aṭ-Ṭusī (1201–1274 A. D.) one of the greatest scholars in the middle ages, who has left voluminous works on mathematics and astronomy.(4) And what must be remembered above all is that he was given facilities by Hūlāgū 旭烈兀 in the 9th year of the Emperor Hsien-tsung 憲宗 of Mongolia (1259 A. D.) to build at Marāgha in Aẓarbāijān an observatory provided with a library containing a large collection of books.(5) Among his works there is one entitled "*Taḥrīr-kitābi Uqlīdisi fī ʿilmi al-Handasati*" (Revision of EUQLID's book on geometry)(6). 兀忽列的 under this item may be the transcription of the name UQLĪDIS only given in this book. In the following examples, such are rather common; it seems that few transcriptions give names in such a complete form.

(2) *Han-li-su-kʿu* 罕里速窟 Yün-chieh-suan-fa-tuan-mu 尤解算法段目 (Solution of Mathematical Problems) San-pu 三部 3 Items

It is regrettable that the writer could not give with conviction the original of this transcription. 罕 (*han*), according to the Toyo Bunko copy is used for *ham, han, ḥan, khan,* as in the case of *fa-han* 法罕 for *faham* (*fahm*)=hsing 省 (knowledge), *han-sa-yeh* 罕撒夜 for *ḥamsāyah*=lin 鄰 (neighbour), *han-ti-tan* 罕底丹 for *khandīdan*=hsiao 笑 (laugh), *han-tu-na* 罕都納 for *ḥamdūnah*=hou 猴 (ape), *a-han* 阿罕 for *āhan*=tʿieh 鐵 (iron). 里 (*li*), in the same book, stands for *ri* (*rī*), *li* (*lī*) as in the case of *li-ko-pu* 里噶卜 for *rikāb*=têng 鐙

(1) SARTON, *op. cit.*, Vol. I, p. 123.
(2) *ibid.*, Vol. II, p. 506.
(3) *ibid.*, p. 624.
(4) *ibid.*, p. 753.
(5) *ibid.*, p. 754.
(6) Philip. K HITTI, Nabih Amin FARIS, Butrus ʿAbd al-Malik, *Descriptive Catalog of the Garrett Collection of Arabic Manuscripts in the Princeton Univ. Library, op. cit.*, p. 330, 153 L. 1054. The copy in the possession of this library is said to be a handwriting copy of Muḥ. ibn Abī 'l-mutiyab at-Turkmānī, dated 730 A. H. (1330 A. D.)

(stirrup), *san-tê-li* 散得里 for *sandali*=橙 (bench), *ha-li* 哈里 for *khali*=k'ung 空 (empty). 速 (*su*) stands for *su* (*sū*), *ṣu* (*ṣū*) as in the case of *wu-su-tu-êrh-la-pu* 兀速都兒剌不 for *uṣturlāb, usturlāb*; *su-t'u-ên* 速禿恩 for *sutūn*=chu 柱 (pillar), *su-fa-lê* 速法勒 for *sufāl*=wa 瓦 (tile) in the Toyo Bunko copy; and *su-êrh-pu* 速兒卜 for *surb*=ch'ien 鉛 (lead), *su-fu* 速伏 for *ṣūf*=hsiao 校 should read (so)-fu (梭) 甫 (wool), *la-su* 剌速 for *rāsū*=huang-shu 黃鼠 (weasel); on a rare occasion it represents *sa* as in the case of *su-lu* 速魯 for *sarv*=sung 松 (cypress tree) in the Toyo Bunko copy, this, however, must be a corruption of *sūrū*. 窟 (k'u) is rarely used in transcription; but as *k'u* 苦 which has the same pronunciation as 窟 is used by the Toyo Bunko copy for *ku* as in the case of *ku-su-fu* 苦蘇夫 for *kusūf*=jih-shih 日蝕 (solar eclipse), it represented *ku* (*kū*), and therefore *qū* (*qu*), *q*, *k*. Studying the items in question in the light of these examples of transcription, one finds no word which would correspond to this transcription. So the writer has chosen the Persion word, *hunar-i-sūf* meaning "science of knowledge" based on the idea that mathematics was considered as the basis of all studies, namely the science of knowledge itself. *Sūf* is derived from the Greek word *σοφία*. This word, however, should be studied more carefully. When one studies words connected with mathematics in STEINGASS[1] mathematics is usually called *'ilmi riyāẓat* (*riyāẓī*); arithmetic *'ilmi-ḥisāb*, *'ilmi raqam*, *'ilmi-'adad* (*ghubār*); algebra *al-jabr wa'l-muqābalah*; geometry *'ilmi-andāza*, *'ilmi-handasat 'ilmi-masāḥat*; trigonometry *'ilmi-muṣallaṣ* (*raṣad*); especially plane geometry *ilmi muṣallaṣi musaṭṭaḥ*; solid geometry *'ilmi muṣallṣi kurawā*. So it would be difficult to find an original word among these which phonetically resembles the transcription.

(3) *Sa-wei-na-han-ta-hsi-ya* 撒唯那罕答昔牙 Chu-pan-suan-fa-tuan-mu-ping-i-shih 諸般算法段目幷儀式 (All kinds of Mathematical Problems and Figures), Shih-ch'i-pu 十七部 17 Items

If the first three letters are separated, the remaining four letters reading *han-ta-hsi-ya* will remind one of *handasaẗ* an Arabic word which originally meant geometry.[2] The word is a corruption of *andāza*, an old Persian word, according to STEINGASS. The transcription here was probably based on *han-dasīyah*, the Persianized reading of *handasīyat*, the Arabic feminine adjective. The first three letters seem to correspond to a word meaning 儀式 (figure). As in the case of *sa-ma-êrh-han* 撒馬兒罕 for Samarqand, *sa-ma* 撒麻 for *samā'*=hun-t'ien 渾天 (the whole heaven) as investigated in Section II, *sa-lê* 撒勒 for *sāl*=nien 年 (year), *sa-fu* 撒夫 for *sāf*=ch'ing 晴 (clear weather), *su-pu-hêi-sa-ti-ko* 速卜黑撒的革 for *subḥ sādiq*=t'ien-hsiao 天曉 (the true dawn), according to the Toyo Bunko copy, 撒 is read *sa* (*sā*), *ṣa* (*ṣā*), rarely *ṣā* (*thā*) as in the case of *sa-pi-ta-t'ê* 撒必他忒 for *ṣābiṭāt*=tsa-hsing 雜星 (fixed stars). When the

(1) STEINGASS, *op. cit.*, p. 863.

(2) As examples of this word used in titles of books, see *Descriptive Clataog of the Garrett Collection, op. cit.*, pp. 32, 653; *Bibliothéque nationale, Catatogue, op. cit.*, pp. 89. 535.

Awa Library copy gives *sa-tê-li* 撒得力 for pai-t'an-hsiang 白檀香 (sandalwood perfume) and 撒得力 for têng 凳 (bench), the original for the former must be *ṣandal*, and that of the latter *sandalī*, but such transcriptions are exceptional, then *san* 散 being used rather than *sa* 撒. As a matter of fact, the Toyo Bunko copy gives none for the former, but 散得里 for the latter. 唯 (wei) like 畏 and 委 probably transcribed a sound like *wi*; 那 (na) used in the Awa Library copy for *na* (*nā*) as in the case of *na-tsun* 那尊 for *naẓm*=shih 詩 (poetry), and *na-mi* 那密 for *nām*=ming-tzŭ 名字 (name); so if there were such an original word as *sāwinah* for *sa-wei-na* 撒唯那, it would be the most suitable. According to STEINGASS, there are such words as *sāvna*, *sawīn*, but they have no likely meaning. If forced to select one, it must be *sān* a Persian word meaning 'method, figure diagram, etc.' Thus the writer has not so far been able to obtain the precise original word; but he is convinced that the part still undeciphered must be Persian or Arabic, and of no other genuine foreign language. He would humbly ask the learned reader to lighten him on this matter.

(4) *Mai-chê-ssŭ-ti* 麥者思的 Tsao-ssŭ-t'ien-i-shih 造司天儀式 (Construction of Astronomical Instruments), Shih-wu-pu 十五部 15 Items

The above three books were relative to mathematics, but this seems to be a work on astronomy according to the Chinese translation. As to 麥 (mai), the writer has been unable to find an example in which this letter is used, but 買 of the same pronunciation is used according to the Toyo Bunko copy for *mai*, *mī*, and therefore can be used for *ma*, *me* as in the case of *mai-t'a-ên* 買搭恩 for *maidān*, *mīdān*=chiao-ch'ang 教場 (parade ground, battle-field). Examples for 思 and 的 having already been given, examples for 者 (chê) only will be cited here. The Toyo Bunko copy gives *chê-ma-ê-t'ê* 者媽額忒 for *jama'at*=chü 聚 (crowd, collection), *chê-ha-ên* 者哈恩 for *jahān*=shih 世 (world), and *chê-nu-pu* 者奴卜 for *janūb*=nan 南 (south). Therefore, *chê* 者 seems to be used exclusively for transcribing *ja*. Based on the analysis of these sounds, the writer is of the opinion that this was beyond doubt a transcription of *Σύνταξις Μεγιστή* (great collection) in 13 vols., the monumental work of PTOLEMAIOS, the great Greek scholar. This work had long before attracted attention in Arabia, and had been translated into Arabic for al-Ma'mūn, the Khalīfa who regarded himself as an astronomer, by an anonymous translator; then by al-Ḥajjāj, the translator of the "Elements" of EUCLID, and again by Isḥāq ibn Ḥunain (or Ḥunain Abū Isḥāq, his father); and the latter work had already been revised by Ṣābit ibn Qurra (d. 901 A.D.)[1] As for the periods more or less near the beginning of the Yüan dynasty, 'Abd al-Malik ash-Shīrāzī made an epitome (Mukhtaṣar) of this work in the latter half of the 12th century; and this was translated into Persian by Quṭb ud-Dīn ash-Shīrāzī.[2]

(1) *Encyclopaedia Britanica*, the article on PTOLEMY.
(2) SARTON, *op. cit.*, Vol. I, p. 401.

The great Nāṣir ud-Dīn aṭ-Ṭūsī also has left a study on this entitled "Tazkirah"[1] As he died at 74 years of age in the 11th year of *Chih-yüan* (1274 A. D.), it could not be asserted that the library annexed to the Northern Observatory in the 10th year of *Chih-yüan* did not contain this work on EUCLID or PTOLEMAIOS. The Arabians, wishing to indicate the great worth of the original work by PTOLEMAIOS, added an article *al* to *Μεγιστή*, and called it merely al-Majisṭī, or al-Mijasṭī, 麥者思的 was probably the transcription of the latter with *al* left out. It goes without saying that the Greek astronomy exercised a great influence throughout the Islam world but a matter of considerable interest is that through the Islam world, first the astrolabe and then translations of the works of EUCLID and PTOLEMAIOS came to be introduced into the East Asia.

(5) *A-kʻan* 阿堪 Chüeh-tuan-chu-pan-tsai-fu 訣(決?) 斷諸般災福 (Determining Calamities and Blessings of Various Kinds), ?-pu 部 ?Items

阿 (a, ê) in the Toyo Bunko copy of the *Hui-hui-kuan-i-yü*, is used for *a* (*ā*), *ʻa* (*ʻā*), *gha* (*ghā*) as *a-pu-êrh* 阿卜兒 for *abr*=yün 雲 (cloud), *a-fu-ta-pu* 阿夫他卜 for *āftāb*=jih 日 (the sun), *a-lan* 阿藍 for *ʻalam*=chʻi 旗 (flag), *mu-a-ting* 母阿定 for *maʻdin*=kʻuang 鑛 (mine), *mu-a-kʻo* 母阿克 for *maghāk*=shên 深 (deep), *tan-a* 貪阿 for *tamghā*=yin 印 (seal), *a-êrh* 阿兒 for *ghār*=tung 洞 (cave). And 堪 (kʻan) is used in the Toyo Bunko copy for *kan*, *kam* as 堪 for *kʻam*=chien 減 (diminished), *shih-kʻan* 石堪 for *shikam*=fu 腹 (abdomen), *kan-tʻê-êrh* 堪忒兒 for *kamtar*=kua 寡 (scarce). It is the writer's view to interpret the two letters 阿堪 as a transcription and chüeh-tuan-chu-pan-tsai-fu 訣斷諸般災福 as a Chinese translation, because he thinks the ideograph 訣 should read 決 and be combined with the next word 斷 to make up a phrase 決斷 (to determine). This will probably be accepted as the correct view. When the Chinese translation and the transcription are considered in the light of each other, *ḥakam* the Arabic word meaning 'a magistrate, arbitrator, judge' may be chosen as the original. From this the phrase 決斷 (to determine) was formed, and 諸般災福 (calamities and blessings of various kinds) was probably added by inferring the contents of the book. The abstract noun of *ḥaham* being *ḥukm*, it will not fit this case. If *ḥakam* is left out, 阿 (a, ê) should have to represent *ḥa* and seem unreasonable at a glance, nor is found such an example among the above examples. That is not improbable, however. It will be investigated in connecton with (16).

(6) *Lan-mu-li* 藍木立 Chan-pu-fa-tu 占卜法度 (Rules of Fortune-telling), ?-pu 部 ?Items

No special investigation is needed for 木 (mu) and 立 (li). Examples of transcription of 藍 (lan) will be studied. A study of the Toyo Bunko copy shows that 藍 is used for *ram*, *ran*, *lam*, *lan* as *a-lan* 阿藍 for *ʻalam*=chʻi 旗 (flag), *ko-lan* 革藍 for *qalam*=pi 筆 (pen, reed), *hêi-lan* 黑藍 for *haram*=chia 家

(1) *ibid.*, Vol. II, p. 754.

(house), *shê-t'ê-lan-chih* 捨忒藍知 for *shatranj*=ch'i 棋 (chess), *mu-lan-pai-ê* 母藍百額 for *murabba'*=fang 方 (square). In the last example, it is read *ra* before the *b* sound which follows it, and should read *muramba'* unless followed by the *b tashdīd*. In the Arabic language, a prophet, a fortuneteller is called *rammāl*; and *rammālī*, a sister word to this and one in common with the Arabic and Persian languages, will mean "the science of fortunetelling," "the science of prophesying" and approach the Chinese translation 占卜法度 (the rule of fortunetelling). By the way, *'ilmi-raml* is another phrase for the science of fortunetelling.

(7) *Ma-t'a-ho-li* 麻塔合立 Tsai-fu-chêng-i 災福正義 (Astrology), ?-pu 部 ?Items

In the Arabian language, there is a verb *adkhala* meaning 'to go in, begin.' A noun derived from this verb is *madkhal* which means 'entrance, door-way, time or place for entering, way of dealing with affairs'; *madkhalī* means 'entrance, admission, recognition.' 麻塔合立 (ma-t'a-ho-li) may be a transcription of *madkhal*. According to HOUTSMA's catalogue of Arabic and Turkish manuscripts,(1) a book entitled "*Kitāb madkhali 'l-kūshiyār*" is mentioned, and an exposition on it says "manual d'astrologie composé en 357 par Kouchiyâr ibn Labbân ibn Bachehrî al-Djîlî." So this was a book of astrology by a man named Kūshiyār compiled in 357 A.H. (967–968 A.D., the 5th year of *Ch'ien-tê* 乾德 and the 1st year of *K'ai-pao* 開寶 of the Sung dynasty). 麻塔合立 under this item corresponds to *madkhali* in *kitāb madkhali*, and the contents, considering the Chinese translation 災福正義 (calamities and blessings correctly explained), must also have been a book of astrology. Of course, it could not be asserted as a compilation by Kūshiyār, but it may be inferred that only the title and contents resembled his. But the use of 塔 for the *d* sound is rather exceptional.

(8) *Hai-ya-t'i* 海牙剔 Ch'iung-li-fa-tuan-shu 窮歷法段數 (Astronomy,) Ch'i-pu 七部 7 Items

海 (hai) used in *hai-êrh-pu-tzŭ* 海兒卜子 for t'ien-kua 甜瓜 (water melon), in the Awa Library copy of the *Hui-hui-kuan-i-yü* reminds one of the original word *kharbuz*; but the use of 海 for *kha* is by no means proper. That 海 should rather represent *hai, ḥai khai, hi, ḥi, khi* will be clear by referring to 麥 (mai) under (4). 牙 is *ya* (*yā*) phonetically, as in the case of 罕答昔牙 for *handasīyah* under (3). 剔 (t'i) is seldom used in the Toyo Bunko copy, but often occurs in the Awa Library copy. For t'ien 田 (field) is assigned *chi-la-a-t'i* 卽剌阿剔 which must be *zirā'at*, for p'ing 平 (level) *la-ssŭ-t'i* 剌思剔 which must be *rast*, and for shih 時 (time) *sa-a-t'i* 撒阿剔 which must be *sā'at*; so the ideograph 剔 seems to represent the *i* sound as a rule, and very rarely *t'i-êrh* 剔兒 for *tīr, ter*=chien 箭 (arrow). From these examples 海牙剔 probably represents *hai'at*

(1) M. Th. HOUTSMA, *Catalogue d'une collection de manuscrits arabes et turcs, op. cit.*, pp. 85, 502–1.

(*haiyat*), a noun derived from the Arabic verb *haiyā* which means 'prepare, appear." This word implies 'shape, appearance; shapes, phenomena, sight-points of heavenly bodies; astronomy (more properly prefixed by 'ilm).' So it has been made clear that 窮歷法段數 means astronomy.

Though of a later date, a work by Zain ud-Dīn 'Alī Kūshjī of the latter half of the 15th century is entitled "*Risālat fī 'ilmi al-hai'ati*" (Introduction to astronomy).(1)

(9) *Ho-hsieh-pi-ya* 呵些必牙 Chu-pan-suan-fa 諸般算法 (Arithmetic), Pa-pu 八部 8 Items

The Chinese translation and the modern pronunciation *ho-hsieh-pi-ya* of the transcription 呵些必牙 would recall to one's mind Arabic verb *ḥasaba* which means 'to count, calculate, compute.' Little doubt could be raised as to the fact that 謼撒卜 (hu-sa-pu) for suan 算 (calculate) recorded in the Awa Library copy represents *ḥisāb*, a noun derived from *ḥasaba*. As already stated, arithmetic, the science of number, is called *'ilmi ḥisāb* for the same reason. It is evident that 呵些必牙 is not the same thing as this. For the first three letters, leaving out the letter 牙 may be assigned *ḥāsib* meaning 'one who calculates, a counting-machine'; but then it would not fit the translation, and the ideograph 牙 would be isolated. Therefore, the writer would consider it the most appropriate to assign *ḥisābiyāh*, the Persianized pronunciation of *ḥisābiyāt*, the above-mentioned feminine adjective of *ḥisāb* meaning 'calculation, arithmetic.' The use of the adjective was probably due to the omission of a suitable noun which preceded it. Objection may be raised as to representing *ḥi* with 呵 (ho) and *sā* with 些 (hsieh); but it would seem better to read *hasibiyah* in transcribing the original *ḥisābiyāh*, than an adoption of 些 for the corrupted sound like the Japanese sound *sa*. The final *h* is silent. A number of works on mathematics contain the word *ḥisāb* in their titles.(2) *Ḥisābiyāh*, the form adopted in this item seldom occurs.

(10) *Chi-ch'ih* 積尺 Chu-chia-li 諸家歷 (Various Calendars), Ssŭ-shih-pa-pu 四十八部 48 Items

As already discussed in detail, the original was *zīch*. As the best-known title containing this term, *Zīchi Īlkhānī* (or Zīji Īlkhānī, this being the more proper form in spelling) should be mentioned. As previously stated, Nāṣir ud-Dīn aṭ-Ṭūsī, the great scholar, in 1259 A.D. was given facilities by Hūlagū 旭烈兀 in building, at Marāgha in Azarbāijān, an observatory provided with a splendid library. Indeed, the chief task carried out with him as leader lay in compiling this very work *Zīchi Īlkhānī*, which was completed in 1272 A.D. (the 2nd year of *Chih-yüan* 至元). And this work not only had some originality, but extensively circulated and introduced even into China, according to SARTON.(3)

(1) E. BLOCHET, *op. cit.*, Vol. II,p. 65; *Bibl. nation., Catalogue, op. cit.*, p. 81.
(2) See *Catalogue d'une collection de manuscripts arabes et turcs, op. cit.*
(3) SARTON, *op. cit.*, Vol. II, p. 754.

BLOCHET says that this work contains the Chinese name of the zodiac, and seems to have been assisted by Chinese scholars.(1) These terms will be taken up and explained in the writer's article entitled "*Huihuikan-yakugo go shaku*" (Lingustic notes on the translated words in the *Hui-hui-huan-i-yü*).(2) The writer is firmly convinced that these famous astronmical tables were surely included in 諸家歷 of the *Yüan-pi-shu-chien-chih*. Besides these, there are *Zīj sulṭāni Kūrgāni*(3), *Zīj aj-Jad*(4), *Zīj-Ulgh-beg*.(5) These are all of later dates.

(11) *Su-wa-li-k'o-wa-ch'i-pi* 速瓦里可瓦乞必 hsing-tsuan 星纂 (Diagrams of Stars), Ssŭ-pu 四部 4 Items

The presence of the ideograph 星 (star) will recall in one's mind of *kaukab* one of the Arabic words meaning 'star'. The latter four letters in the transcription seem to represent a word for star, but this *k'o-wa-ch'i-pi* could not be assigned directly to this *kaukab*. The letter 瓦 as 洼 the letter with the same pronunciation is always used for *wa* in the Toyo Bunko copy as *hei-wa*=黑洼 for *hawā*=t'ien-ch'i 天氣 (weather), *t'ê-wa-êrh* 迭洼兒 for *dīwār*=ch'iang 墻 (wall), *chu-wa-ên* 主洼恩 for *jawān*=shao 少 (young, youth), *a-wa-tzŭ* 阿洼子 for *āwāz*=shêng-yin 聲音 (voice), *sa-tzŭ-wa-li* 撒子洼力 for *sāzwārī*=ho-mu 和睦 (reconciliation). And 乞 (ch'i), according to the Awa Library copy is used for *ki* as in ch'i-lin 乞林 for *kirm*=ch'ung 蟲 (worm), *ch'i-ta-pu* 乞他卜 for *kiṭāb*=shu 書 (book). It is thus evident that *k'o-wa-ch'i-pi* 可瓦乞必 stands for *kawākib* the plural form of *kaukab*. If so the former half 速瓦里 (su-wa-li) must be *suwar*, the plural form of the Arabic noun *ṣaurat*, (or *ṣūrat*) meaning 'form, figure, appearance, style, painting, portrait.' These two words are linked in the Persian style to read *ṣuwar-i-kawākib*, the letter 里 (li) indicating the combination of *r* and *i* in it. The book may be called hsing-ch'ên-t'u-shih 星辰圖式 (a diagram of stars).

(12) *Sa-na-ti-a-la-t'ê* 撒那的阿剌忒 Tsao-hun-i-hsiang-lou 造渾儀香漏 (Directions for Constructing Astronomical Instruments), Pa-pu 八部 8 Items

From the Chinese translation one could tell that this book was a guide-book in making astronomical instruments. The letters here used in transcription being all those which have already been confronted, the latter half 阿剌忒 (a-la-t'ê) would recall to one's mind the Arabic word *ālāt* (s. *alat*) meaning 'instruments.' Then from 撒那的 one could deduce the Arabic word *sanat* meaning 'one year or a period of one revolution of the sun.' If so, 渾儀香漏 must be "instruments for calculating the year (revolution) of the sun" and this book is a guide-book for making this instrument, entitled "*sanat ālāt*."

(1) E. BLOCHET, *Catalogue des manuscripts persans, bibliotheque nationale, op. cit.*, tom. II, p. 53.
(2) Tōyō Gakuhō 東洋學報, Vol. XXX, 1943; Vol. XXXIII, 1950.
(3) BLOCHET, *op. cit.*, tom II, p. 63.
(4) HITTI, *Descriptive Catalog of the Garrett Collection of Arabic Manuscripts in the Princeton Univ. Library, op. cit.*, p. 309.
(5) HITTI, *op. cit.*, p. 311; BLOCHET, *op. cit;*, p. 65.

(13) *Sa-fei-na* 撒非那 Shê-pan-fa-to-tsuan-yao 設(諸?)般法度纂要 (Laws of Various Kinds), Shih-êrh-pu 十二部 12 Items

Shê 設 is no doubt an error, and should read *Chu* 諸, so only 撒非那 must be letters for the transcription. Examples for 撒 and 那 having already been presented, those for 非 (fei) only will be given. This letter, in the Toyo Bunko copy, is used for *fi*, *fī* as *fei-lê* 非勒 for *fīl*=hsiang 象 (elephant), *fei--ssŭ-t'ê-ko* 非思忒革 for *fistuqī* (*fistaq*?)=liu-ch'ing 柳青 (of a pistachio, sea-green), *fei-hsi-êrh-tan* 非洗兒丹 for *fisurdan*=tung 凍 (freeze, concrete). Under the 2nd month of the Mohammedan Calendar in the *T'ien-fang-li-yüan* 天方曆源 reprinted in the lst year of *Kuang-hsü* 光緒 of the Ch'ing dynasty, which will be later referred to, there occurs such an example in which *shai-fei-êrh* 色非爾 stands for *ṣafar*. This, however, should be regarded as an extremely awkward way of transcription. The original word inferred from 撒非那 must be such forms as *sāfina* (*h*), *safīna* (*h*). But there is none which could satisfy the Chinese translation. *Sān* is one of the Persian words meaning 'law'; *fann* (pl. *afnān*) an Arabic, and *fan* a Persian noun, meaning 'kind, category, branch of science or art,' and Persian grammar allows such two words to be combined without the iẓāfa, as in the case of the preceding item. As a result of investigating *sānfan* with the meaning of the branch(es) of law, did it become the Chinese translation 法度纂要 (summary of law)? This might satisfy the translation, but not the transcription. It is hoped that the complete interpretation of this item will be achieved in the future.

(14) *I-ch'i-hsi-êrh* 亦乞昔兒 Shao-tan-lu-huo 燒丹爐火 (Alchemy), Pa-pu 八部 8 Items

The rest of the items are all books and instruments used at the residence of the T'i-tien-kuan 提點官 (Superintendent) of the Hui-hui-ssŭ-t'ien-t'ai 回回司天臺 (Hui-hui Observatory). If the Chinese translation 燒丹爐火 is correct, this must be a book on the art of alchemy. Examples for these four letters used in transcription have already been presented; there is no necessity of demonstration. It would be sufficient to assign the English word elixirs for the Arabic original *iksīr* both from the transcription and from the translation. The word is derived from the Arabic verb *kasara* meaning 'to destroy, to be broken to pieces, ferocious, to be disappointed,' and means 'alchemy, the elixir of life, the philosopher's stone.' The well-known alchemist in the latter half of the 13th century, which corresponds to the reigns of the Emperors Hsien-tsung 憲宗 and Shih-tsu 世祖 at the opening of the Yüan dynasty, was Abū 'l-Qāsim Muḥammad ibn Aḥmad as-Simawī al-'Irāqī whose exclusive work on alchemy was "*'Arf al-'abīr fī 'ilmi al-iksīr*" (Saffron Perfume in Alchemy), a criticism on the hypothesis advanced by his predecessor ar-Rāzī.(1) The present writer has not investigated the exact date of its compilation; the present book might be the identical work.

(1) SARTON. *op. cit.*, Vol. II, p. 1045.

(15) *T'ê-pi* 忒畢 I-ching 醫經 (Medical Science), Shih-san-pu 十三部 13 Items

This has been investigated in much detail. Medical books which include طب (*ṭibb, ṭabb*) in their titles are so extremely numerous that it is rather difficult to select from among them. (See *Catalogue d'une collection de manuscripts arabes et turcs*, mentioned above.)

(16) *Ai-chieh-ma-ta* 艾竭馬答 Lun-shuo-yu-wu-yüan-liu 論說有無源流 (Philosophy?), I-shih-êrh-pu 一十二部 12 Items

Judging from the Chinese translation, this seems to be a book of logic and philosophy. The only likely word of this meaning in the Arabic and Persian languages is the noun *ḥikmat* derived from the Arabic verb *ḥakama* meaning 'to rule, to dictate, to judge, to determine.' To cite an example of this word, there is a commentary of the 15th century by Muḥammad ibn Sharīf al-Ḥusaini entitled "*Sharḥ Hidāyat al-Ḥikmat.*" The text of this work is a treatise of physics and metaphysics.(1) As the modern pronunciation of 艾 is *ai*, and is used for transliterating *ā'i* under (22) as will be discussed later, this letter would seem improper for representing *ḥi* in this connection. However, because as stated under (3), the Arabic word *handasat* came from the Persian *andāza*, and the Persian word *hasht* meaning 'eight' from the Sanscrit *ashtan*, according to STEINGASS, an original plain vowel at the beginning of a word sometimes comes to be pronounced with an *h* sound prefixd to it. And in some transcriptions by Chinese, foreign words beginning with such vowels as *a, o, u*, are sometimes transcribed with ideographs beginning with each consonant as *h. w.* For instance, 合 (hap) for *alp* the Turkish word meaning yung-mêng 勇猛 (brave); *ho-la* 曷剌 for *ala-at* the Uigur word meaning po-ma 駁馬 (dapple horse); *ho-la-ch'i* 曷剌齊 for *aradja* the Mongolian word meaning lo-ma 駱馬 (black-maned horse).(2) From these examples it may be seen that a single vowel at the initial syllable and an initial syllable beginning with the consonant *h* are easily interchangeable. According to the traditional way of transcription in China, the present case seems to be the reverse of the examples given above, but in view of the fact that 艾 is *gai* in Japanese pronunciation, it may not be entirely wrong to let it represent not only *ā'i*, but also *hai* (*ḥai*), *hi* (*ḥi*). On a similar ground, the writer interpreted *a-k'an* 阿堪 under (5) to be the transcription of *ḥakam*. Examples for 竭 (chieh) are not available. All other letters have already been investigated.

(17) *T'ieh-li-hêi* 帖里黑 Toung-nien-hao-kuo-ming 總年號國名 (Names of All Eras and Dynasties), San-pu 三部 3 Items

If the Chinese transcription refers to the names of all eras and dynasties,

(1) HITTI, *op. cit.*, p. 272.

(2) K. SHIRATORI, "Tōko Minzoku Kō 東胡民族考" (A Study of Tung-hu tribes), Shigaku Zasshi 史學雜誌, Vol. XXII, p. 592.

this must mean a history, or a chronology. What does the transcription tell? 里, as already stated, represents *li, lī, ri, rī* and sometimes simply *l*, r. An example of t'ieh 帖 used in transcription is found in the transcription t'ieh-chih 帖直 for *tāzī* (Arab) in the *Ch'ing-ching-ssŭ-chi* 清淨寺記 (Min-shu 閩書, Vol. 7) by Wu Chien 吳鑒 of the last part of the Yüan dynasty, where a passage reads 有國曰大食, 於今爲帖直氏: "There is a land called Ta-shih 大食. Now it is called T'ieh-chih 帖直 family." Thus 帖 is the transcripton of *tā*. And t'ieh 貼 of a similar pronunciation is used, by the Toyo Bunko copy, in *t'ieh-tzŭ* 貼子 for *tez*=chi 急 (urgent), and in *t'ieh-ê* 貼額 for *tegh*=chien 劍 (sword) by the Awa Library copy; thus it may be understood to represent *te*. Examples for 黑 (hêi) are numerous. The Toyo Bunko copy gives *yeh-hêi* 夜黑 for *yakh* =ping 氷 (ice), *hêi-t'a-i* 黑他衣 for *khatāyī*=han-jên 漢人 (Chinese people), *hêi-lê-pi* 黑勒必 for *ḥalabī*=po-li 玻黎 (white iron), *ko-tê-hêi* 革得黑 for *qadaḥ*= chung 鐘 (goblet bell), *hêi-wa* 黑洼 for *hawā'*=t'ien-ch'i 天氣 (weather), *ch'a-hêi* 叉黑 for *chāh*=ching 井 (a well), *su-la-hêi* 速剌黑 for *surāḥī*=hu 壺 (long-necked flask), *ko-hêi-li* 噶黑里 for *kahilī*=lan 懶 (tardiness), *na-wa-hêi* 納洼黑 for *nawaḥī*=ching 境 (boundary); so *hêi* 黑 represents *ha, ḥa, kha, h, ḥ*, kh, and in some examples, *h(ḥ)i, h(ḥ)ī*. *T'ê-wa-lieh-hêi* 忒洼列黑 for *tawārīkh*=shih 史 (history) in the Toyo Bunko copy is an example of 黑 representing *kh*. *tawārīkh* is thus history, chronology, but this is the plural form, the singular being *ta'rīkh*, and *tārīkh* in the Persian style. As shown in the previous example, 帖 may be taken as a letter representing *tawā*, or *tā, ta'*. This should be the only original word that is sought here. Among these, pronunciation in the Persian style may be regarded as the most suitable. Historical works which contain the word *tawārīkh* (*ta'rīkh*) are so numerous that it is difficult to tell whose book this referred to. The writer is of the opinion that the Chinese translation 總年號國名 suggests that the contents of the work had something of a universal history. The *Jamī'a 't-Tawārīkh* (General history of the world, Collection of annals) by the famous Rashīd ud-Dīn (Fazal Allāh Rashīd ibn Abū 'l-Khair) had not been published yet,(1) the new well-known books at that time were the *Kāmil at-Tawārīkh* (Complete history) by 'Alī ibn al-Aṣīr (1160–1233) and the *Tārīkh Jahān Kushāi* (History of world conquerors) by Alai ud-Dīn Atta-Mulk Juwāinī (-1282+ A.D.). This item might have referred to either of these two books. The writer, however, would rather assign to it the *Tawārīkh*, the classical history by Abū Ja'far Muḥ. ibn Jarīr ibn Yazīd aṭ-Ṭabarī (838–923 A.D.). *Tawārīkh* (or *Tārīkh*) *Akbar ar-Rasūl wa'l-Mulūk* had been called merely *Tārīkhi Ṭabarī* or *Tārīkh*; and the Persian translation had been published. No other likely history could be asssigned to it.

(18) *Mi-a* 密阿 Pien-jên-fêng-shui 辨認風水 (Selection of graveyards), San-pu 三部 3 Items

This is one of the most difficult items to interpret. From the Chinese

(1) Vol. 1 of this book was completed in the 7th year of *Ta-t'ê* 大德 or 1303 A.D.

translation 辨認風水, this might be regarded as a topographical study of graves. Investigation on the transcription would seem impossible. 密 (mi) would read *me, mī,* judging from the examples of transcribing foreign words into Chinese, as the Toyo Bunko copy gives *Hêi-t'ê-mi* 黑忒密 for *khaṭme*=k'uei 葵 (marsh mallow), *a-tê-mi* 阿得密 for *ādamī*=jên 人 (man), or *m, mi, mī* as the Awa Library copy gives *mi-ssŭ* 密 (the original copy reads *mi* 蜜) 思 for *mis*=t'ung 銅 (copper), *hsi-t'a-mi* 洗他密 for *sitām*=p'ei 轡 (bridle), and *ya-mi* 丫密 for *yām*=kuan-i 館驛 (posthouse). 阿, as seen in the examples under (5) reads *a* (ā), *'a* (*'ā*), *gha* (*ghā*). According to the respective examples of the two ideographs, one might form such a word as *migha* and look it up in dictionaries, but no word would be found which suits the Chinese transcription. In view of the fact that in transcribing a foreign word in China, initial vowels are sometimes omitted, one may look for a word, keeping this fact in one's mind, but all in vain. On the other hand, *m* and *b* have been interchangeable from ancient times; and an investigation by a previous scholar shows that the ancient pronunciations of the ideograph 密 were *mat, mit, met,* and also *bat, bit, bet.*(1) The application of this method also resulted in a failure. So it is impossible to accept this transcription as it stands. The writer is of the opinion that *miyah* (various waters), the plural form of mā' the Arabic word for water, would be the word sought. This would be a fair appoach to both transcription and translation.

(19) *Fu-la-san* 福剌散 Hsiang-shu 相書 (Physiognomy), I-pu 一部 1 Items

It may be comparatively easy to detect the identity of this book from the Chinese phrase 相書. The Arabic verb *farasa* has among its meanings 'to judge;' and *firāsat,* the noun derived from it, means 'physiognomy, judging of the character from one's external appearance, true nature, instinct.' The word is adopted in the same form into the Persian language; 'to judge, to foretell' is *firāsat kardan,* and this science is sometimes called *'ilmi firāsat. 'ilm 'al-wujūh, 'ilmi qiyāfa* also refers to the same thing. 散 in 福剌散 (fu-la-san) is used like *sa* 撒, which has been discussed under (3); it is no doubt that the three letters stand for *firāsat* (*firāsah*). *Risāla-i-Dalā'il al-Firāsat* by Muḥammad Mirzā Khān is one like this present book.(2)

(20) *Chê-wa-hsi-la* 者瓦希剌 Pieh-jên-pao-chü 別認寶具 (Appreciation of jewellery), Wu-pu 五部 5 Titles

者 (chê), as shown under (4) has almost always been used in representing *ja.* 瓦 (wa), as proved indirectly under (11), may read *wā* as precisely was the case with (11). There is nothing to be said on 剌. As no example of 希 (hsi) has been found yet, a few will be cited here. The Toyo Bunko copy

(1) SHIRATORI, *Saiiki-shi Kenkyū* 西域史研究 (Study of the history of the Western Regions), Pt. I, p. 126.

(2) E. G. BROWNE, *A catalogue of the Persian Manuscripts, etc., op. cit.,* No. CXXXVI. p. 223.

gives *ma-hsi-chi-êrh* 馬希几兒 for *māhīgir*=yü-jên 漁人 (fisherman), and *ma-hsi* 馬希 for *māhī*=魚 (fish). The letter 希 is thus seen to represent *hi*, *hī* or any sound resembling them.

There is a word *jauhar* in the Arabic language which means, 'gem, pearl.' This word is considered to have been derived from the Persian word *gauhar* according to STEINGASS, but it has gone back into the Persion vocabulary in a new form. The plural form of this word is *jawāhir*, but a further plural form of *jawāhir* is *jawāhirat*. The transcription 者瓦希剌 is probably a representation of *jāwāhira* or *juwāhirah*, that is *juwāhirat* with its final sound dropped. As to the plural form *jawāhir*, it is difficult for the final *r* in the phrase to adjust itself to 剌; so *rah* is much better for the purpose. This is probably a book on the knowledge of jewellery which is the favourite topic of Mohammedans.

(21) *Hêi-ya-li* 黑牙里 Tsao-hsiang-lu-ping-chu-pan-chi-ch'iao 造香漏幷諸般機巧 (Diagrams and Designs of Various Machines), Êrh-pu 二部 2 Titles

A glance at Chinese title will show it to be a guide-book for making various machines. Now that all letters used in the transcription have been investigated, the word which is recalled is *khayālī* meaning 'device, type, style, model for imitation.' It is the verbal noun the fifth form *takhayyala* of the Arabic verb *khāla* which means 'to consider, to believe.' This must be the very word that is sought. So this must be a book on diagrams and designs of various machines.

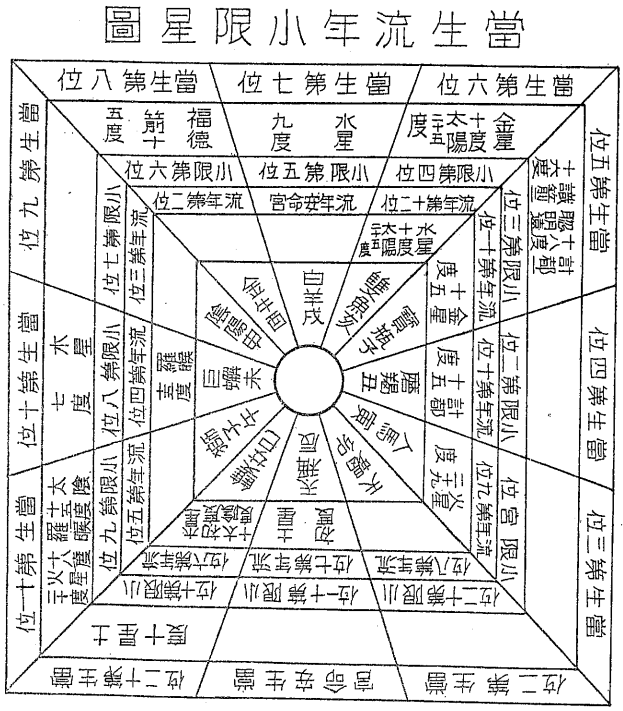
(22) *Shê-ai-li* 虵艾里 Shih 詩 (Poetry), I-pu 一部 1 Title

Poetry in the Arabic language is *shi'r*. This is the word the Toyo Bunko copy records as *shê-ê-êrh* 舍額兒 *shi'r*=shih 詩 (poetry) under its *Wên-shih-mên* 文史門. 虵艾里 (shê-ai-li) seems to fail to represent it. 虵 being similar to 舍, it is possible to transcribe it *shi* as in the case of 舍額兒, but 舍 is used by the Toyo Bunko copy for representing *sha* as seen in the case of *k'o-shê* 科舍 for *goshah*=chiao 角 (angle), and *shê-êrh* 舍兒 for *sharr*=wu 惡 (devil, evil), this seems an ideograph more adequate to represent *sha* than *shi*. 虵艾里 then must be the transliteration of *shā'irī* derived from *shi'r* meaning 'versification, construction of poetry.' If this word is adopted, not only 虵, but also 艾 (ai) and 里 (li) will find their proper places. Therefore, the Chinese translation 詩 (poetry) is rather a careless one, for this work was not on poetry itself, but a guide-book for versification.

(23) *Wu-su-la-pa-ko-k'u-lê* 兀速剌八丫窟勒 Shao-hun-t'ien-t'u 小渾天圖 (A Small Celestial Map)

As the noun *uslūb* derived from the Arabic *salaba* means 'method, order, arrangement, form, shape,' 兀速剌八 (wu-su-la-pa) may be taken as a transcription

of this word *uslūb* despite some obstacles. Examples of these individual letters used in various transcriptions have already been given. Now, the Persian word for 'sun, moon, star, horoscope, fortune-telling' is *hor, hūr* 窟勒 (k'u-lê) must surely be the transcription of this word. And the letter 丫 (ko) here must be interpreted as *kih* the Persian word meaning 'small,' in spite of some slight objection. The original name of this article was *uslūbi-kih-hor*; more specifically, a small map of the zodiac used in astrology. Then the Chinese translation 小渾天圖 (a small celestial map) is one which fairly well conveys its original meaning. Then what was its actual form? Indeed, there have been several kinds. For instance, one is the *Tang-chêng-liu-nien-hsiao-hsien-hsing-t'u* 當生·流年·小限星圖 (See below) given at the end of 第三類 (Group 3), last



Pt., the *Ming-i-t'ien-wên-shu* 明譯天文書 (Book of Islam Astrology translated during the Ming dynasty).[1] As to the *Ming-i-t'ien-wên-shu*, it will be referred to in the following section. By the way, if the small celestial map in question were, not a map of the zodiac used in astrology, but a map showing the actual positions of the heavenly bodies, the *Tang-chêng-liu-nien-hsiao-hsien-hsing-t'u* reproduced here should be considered one belonging to an entirely different system. As long as it is a map of astrology, this small celestial map must pertain to astrology rather than astronomy.

(1) the *Han-fên-lou-pi-chi* 涵芬樓祕笈 edit.

(24) *A-la-ti-sha-mi-la* 阿剌的殺密剌 Ts'ê-t'ai-yang-kuei-ying 測太陽晷影 (A Instrument for Observing Sun-beams), I-ko 一個 One Set

So far only books and maps have been treated, but the following three items all refer to instruments. Now, 阿剌的 (a-la-ti) here is *alāt*, the same word as used under (12) and the *i* sound of the iẓāfa combined, and means 'machine.' If so, 殺密剌 (sha-mi-la) must correspond to a word meaning the shadow of the sun. Now, 殺 having the same pronunciation as sha 沙, examples of 沙 used in transcription may be sought. The Toyo Bunko copy gives *shā* for 沙 as *k'u-sha-tan* 苦沙丹 for *kushādan*=k'ai 開 (open), ch'i-sha-wo-êrh-tzŭ 起沙斡兒子 for *kashāwarz*=nung 農 (farmer); 密 as previously mentioned, represents *mī, mi, m*; and 剌 *la* (*lā*), *ra* (*rā*). Then the most suitable word will be *shāmira* (or *shāmila*). But there is no word in such form which means the shadow of the sun. The writer desires to interpret it to be the Arabic word *sam'al* meaning the shadow. Hence the original word will be *alāt-i-sam'al*, or an instrument for measuring the shadow, and if a special meaning is added to the shadow, it will come to mean the shadow of the sun. Moreover, this word would approach 殺密剌 in pronunciation and prove favourable both in translation as in transcription.

(25) *Ya-t'u-lu* 牙禿魯 Shao-hun-i 小渾儀 (A Small Celestial Globe), I-ko 一個 One Set

This is one of the difficult questions that the writer has not yet been able to answer. According to the previous examples of transcription, 牙 (ya) is generally *yā*, 禿 (t'u) *tu* or *tū*, 魯 (lu) *ru, rū lu, lū*, the word which most resembles the transcription must be *yāturū, yātulū*; but no modern dictionary contains such a word or a word with a vowel prefixed to it which means a small celestial globe. The Persian word *tūr* meaning 'small' might be the likeliest word for the transcription 禿魯. But whether there is a word meaning 'the globe,' represented by a single letter 牙, or a word made up of a missing letter above the letter 牙 and ending in *yā* which means the globe, the writer is not in a position to ascertain. He is of the opinion that the issue must be whether the three letters for the transcription mean 'a small globe,' or the letters 禿魯 (small) being stricken of, and letter 牙 or another added to it may have been used for referring to a celestial globe. The writer desires that the reader will enlighten him on this subject.

(26) *P'ai-êrh-k'o-êrh-t'an* 拍兒可兒潭 Ting-yüan-fang-ch'ih 定圓方尺 (Perfect Compasses), I-ko 一個 One Set

The first half of this last item may be interpreted rather easily. Drawing-compasses, and a ruler in the Persian language are *parkār, pargār, pargāl, pargar, parkāl*, and circles drawn by their means are also so called. It is evident that the four letters 拍兒可兒 (p'ai-êrh-k'o-êrh) refer to these words. Only it must be investigated whether the final letter of this foreign word was an *r*

or *l*. The transcription assigns to it the letter 兒, which is, almost without exception, used for representing the *r* sound; so the word must be one of the three words, *parkār*, *pargār*, *pargar*. Further, in order to ascertain which one of them it was, it is necessary to investigate the transcription of the letter 可. The present writer is of the opinion that 可 (k'o), like 科 which has the same pronunciation, was usually employed to transcribe, not the *g* sound but the *k* sound. In spite of the fact that there are cases in which the letter 克 which has the same pronunciation represents both the *k* and *g* sounds, *parkār* may be determined as the original of this word.

Now, what can the last letter 潭 (t'an) be? *parkār* being drawing-compasses, this may correspond to the Chinese translation 定圓尺 (compasses); then 潭 may be taken to imply the foreign word which corresponds to 定方尺 (ruler). However, it is not necessary to confine it to that. Examples of 潭, by means of t'an 貪 which has the same pronunciation, may be cited from the Toyo Bunko copy. The book assigns *tan*, *tam* to it as 貪 for *tan* (*taman* here should read *tan*)=shên 身 (body), *hua-ssŭ-t'an* 花思貪 for *khwāstan*=t'ao 討 (demand, want), *t'an-a* 貪阿 for *ṭamghā*=印 (seal). As a matter of fact, however, there exists no word resembling it in pronunciation, or formed by prefixing a vowel to it which conveys such a meaning as is sought here. Now, according to SARTON[1] a Mohammedan of East Saracen named Muḥammad ibn al-Ḥusain who was active towards the end of the 12th century and in the beginning of the 13th century, with the co-operation of Kamāl ud-Dīn ibn Yūnus, composed an article on conics entitled "Risāla al-Birkar at-Tāmm" (A treatise on the perfect compasses) between 1187 and 1193 and dedicated it to Ṣalāḥ ud-Dīn (d. 1193 A. D.). The perfect compasses are defined as an instrument by means of which any conic curve could be drawn. This is an extremely convenient explanation. The word used in the present item is not the Arabic *birkar*, but the Persian *parkār* for compasses, but the last letter 潭 probably is the Arabic *tāmm* which means 'perfect.' Properly, it should read *parkār-i-tāmm* with the iẓāfa; but the present writer is convinced that the connective has been dropped.

Here ends the writer's personal interpretation of the original names of the 3 instruments and 23 books recorded in the *Yüan-pi-shu-chien-chih*. In interpreting some of them he has often felt unequal to the task partly due to his natural inability and partly due to the absence of access to a systematically compiled dictionary; he could not have been thorough-going in investigation, and has not succeeded in solving all 26 items completely. On the other hand, the presence of careless transcriptions and corrupted pronunciatsons has probably aggravated the difficulty. If the foregoing interpretation in this inquiry should be generously accepted in spite of its defects, the account in the *Yüan-pi-shu-chien-chih* would be taken to include 3 instruments, 4 mathematical books, 6 books astronomical and calendaric books, 6 horoscopic books (including works

(1) *op. cit.*, Vol. II, p. 401.

on astrology), 2 medical books, one each on the study of history, jurisprudence, philosophy, poetry, jewelry, 23 books in total. This is the sum total when each item is counted as one kind. 兀忽列的 (UQLĪDIS) under (1) is given to be 15 titles, and the total number is as great as given in the foregoing; it is rather doubtful whether all these 15 titles (a similar statement may be made as to other items) were mathematical books by Euqlid of the identical contents. It may be that the books relative to Euqlid, those relative to *zīch* (astronomical table), and those relative to *ṭā'rīkh* (history) were classed under one item; in that case, the number of the books would be much greater. It is also doubtful whether even the text of these items was translated into Chinese. If it actually were, the historical significance would be many times greater. However, the writer does not think so, and is of the opinion that all these books were preserved in the library of the Hui-hui Observatory and in the house of its superintendent, and only those who were connected with them read the books in Arabic and Persian; and probably the men who made use of them were by no means numerous. It must be because of the necessity to report to the court that the Chinese transcriptions and translations of the titles of the original books are recorded in the *Yüan-pi-shu-chien-chih*. So it is almost unnecessary to consider the influence of these books and instruments upon the culture in China. Despite the very limited significance, a great signficance may be attached to these in the eastern infiltration of Islam culture in the history of communication between the East and the West during the Yüan dynasty. And according to the result of this interpretation, these are not all Arabic terms. Even those considered most evidently Arabic seem to have been for some time under the influence of Persian pronunciation and grammar. A number of them are genuine Persian terms. Even the contents of a book with an Arabic title more or less declined like a Persian word, were not in the genuine Arabic language, but composed in accordance with Persian grammar. In view of the fact that at this period and before and after it the Arabic language was freely rushed into Persian, it is evident that books with Persian titles could not have been written in the genuine Persian language, and the presence of Arabic terms especially in physical sciences was probably more prominent than could be imagined to-day. Be that as it may, a study of the 26 terms recorded in the *Yüan-pi-shu-chien-chih* will definitely show how Persianized was Islam culture diffused in China in those days.

Now that the above terms have been interpreted, it would be necessary to investigate names of the authors or makers, and the dates at which these books or instruments came into being, and further to evaluate the contents of the books and the construction of the instruments, and then to determine their positions in the history of Islam culture, and finally to study in detail whether they still exist in the Islam world or not. Further research on these questions, however, will have to be reserved as future subjects of investigation.

IV. The Characteristics of the *Hui-hui-li-fa* 回回曆法

The cultural products, especially astronomical instruments and the books on science chiefly on astronomy, within the sphere of Islam culture which found its way into the East during the Yüau dynasty, have been investigated according to the accounts in the *T'ien-wên-chih* of the *Yüan-shih* and in the *Yüan-pi-shu-chien-chih*; primarily, the nature of these books and instruments has been dwelt upon in the foregoing, but the writer, taking a step further, will attempt to present an external investigation of the characteristics of the Hui-hui Calendar.

In the first years of the Yüan dynasty, the western calendar along with the study of astronomy was introduced into China. As stated previously, in the 4th year of *Chih-yüan* under the reign of the Emperor Shih-tsu, Jamāl ud-Dīn 札馬魯丁 succeeded in constructing 7 instruments and selecting a calendar called *Wan-nien-li* (Permanent Calendar) and presented it to the court. It was certainly based on a western calendar. A passage in the *Li-chih* 曆志 of the *Yüan-shih* says on this calendar 世祖稍々頒行之: "The Emperor Shih-tsu enforced it to some extent." It seems to have been adopted to some extent, but when the *Yüan-shih* was compiled at the beginning of the Ming dynasty, this calendar seems to have entirely disappeared, for the compiler of the *Li-fa-chih* 曆法志 says 惟萬年曆不復傳: "The *Wan-nsen-li* alone has not been handed down" and nothing is recorded in the *Li-fa-chih*. However, some nature of this calendar seems to have known to men of extensive learning, because Sung Lien 宋濂 in the position of chief editor of the *Yüan-shih*, in his preface to a book entitled *Ko-hsiang-hsin-shu* 革象新書, says as follows:

"Some time ago I heard that the West Regions lie tens of thousands *li* away. When the Yüan forces conquered their land, a man named Jamāl ud-Dīn presented the *Wan-nien-li*. The method of his observation consists in making use of only the 12 zodiacal constellations dividing the heaven into 360 degrees. He adopts the theory of Êrh-shih-pa-hsiu-tz'ŭ-shê 二十八宿次舍 (Visiting in succession 28 constellations). No Chinese seems to have heard of all this. In calculating the eclipses of the sun and moon, his method largely coincides with the Chinese method. It is because both are based on the same principles."(1)

The *Ko-hsiang-hsin-shu* is a book of calendar in 5 vols by an anonymous compiler as has been pointed out by the writer of the *Ssŭ-k'u-ch'üan-shu-t'i-yao* 四庫全書提要. By means of the preface of Sung Lien alone, the man's character

(1) 抑々余聞，西域遠在萬里之外．元既取其國．有札馬魯丁者，獻萬年曆．其測候之法，但用十二宮，而分爲三百六十度，至於二十八宿次舍之說．皆若所不聞．及推日月之薄蝕，頗與中國合者．亦以理之同故也．(宋文憲公集，韓刻補輯本 卷四十三．革象新書序)

may roughly be known. Of course, this is by no means a satisfactory record. According to SUNG Lien, this book was written by CHAO Yüan-tu 趙緣督; though a son of the imperial family, his precise name is not known, as may be supposed from the passage. "As he concealed and obscured himself in P'o-yang 鄱陽, his name or sobriquet could not be found. Some say that his name was Ching 敬, and his sobriquet Tzŭ-kung 子恭; others call him Yu-ch'in 友欽. His name could not be ascertained definitely. Therefore, the people, adopting the name he himself assumed, called him Yüan-tu-hsien-shêng 緣督先生."(1) In the Li-suan-lei 曆算類 under Tzŭ-pu 子部, Vol. III in the *I-wên-chih* 藝文志 of the *Yüan-shih*, CH'IEN Ta-chin says: 趙友欽革象新書五卷, "CHAO Yu-ch'in 趙友欽 compiled the *Ko-hsiang-hsin-shu* in 5 Vols."

And according to SUNG Lien, the *Wan-nien-li* was a book of calendar in the fashion of the Western Regions; its characteristic method of observation is pointed out as that of adopting the 12 zodiacal constellations and dividing the heaven into 360 degrees and advocating the theory of Êrh-shih-pa-hsiu-tz'ŭ-shê 二十八宿次舍 (visting in succession 28 constellations). Now, to what system did this method of observation belong? We who have no direct access to the *Wan-nien-li* only have to infer it, if possible, from other accounts. Under the day of *hsin-yu* 辛酉 of the 12th month, the 2nd year of *Huang-ch'ing* 皇慶, (1313 A. D.) under the reign of the Emperor Jên-tsung 仁宗 recorded in the *Yüan-shih* (Bk. 24), it is written that the *Wan-nien-li* compiled by Kalīmatud-Dīn 可里馬丁 was presented to the court; and in view of the fact that the man was a Mohammedan, this calendar must have been more or less in the nature of the one compiled by Jamāl ud-Dīn. Neither is known the contents of the calendar. It should be remembered that among the Mohammedan books in the present China there is one entitled *T'ien-fang-yüeh-shou-wan-nien-li-chên-pên* 天方月首萬年曆眞本, also called *Li-yüan-chên-pên* 曆源眞本, a small book temporarily bound in western fashion which was compiled by MA Ch'êng-tzŭ 馬誠自 of Lo-yang 洛陽 and CHAO Pin 趙斌 of Cho-hsien 涿縣 published in the 14th year of *Ming-kuo* 民國. Of course, it would be impossible to infer from this the *Wan-nien-li* of the Yüan dynasty although that is a Mohammedan calendar. Again, under *Li-shu-lei* 曆數類 in the *I-wên-chih* 藝文志 of the *Ming-shih* (Vol. 98), a passage says that *Wan-li* 萬曆 era a man named CHU Tsai-yü 朱載堉 compiled the *Wan-nien-li* in 1 volume and the *Wan-nien-li-pei-k'ao* 萬年曆備考 in 2 volumes. Neither did this belong to the same system of calendar which Jamāl ud-Dīn had compiled. The *Shêng-shou-wan-nien-li* 聖壽萬年曆 in 2 vols., and the *Wan-nien-li-pei-k'ao* 萬年曆備考 in 3 vols. compiled by Tsai-yü, a subject of CHENG Shih-tzŭ 鄭世子, included in the *Yo-lü-ch'üan-shu* 樂律全書 by CHU Tsai-yü, in spite of the difference in numbers of volumes, must correspond to the two books above-mentioned. This was presented to the court in the 23rd year of *Wan-li* 萬曆 (1595 A. D.), the name *Wan-nien-li* having been no doubt adopted

(1) 先生於鄱陽隱遁自晦，不知其名字. 或曰名敬，字子恭，或曰友欽. 其名弗能詳也. 故世因其自號，稱之爲緣督先生.

in wishing ten thousand years' life for the Emperor.

A hint as to the nature of the *Wan-nien-li* was thus obtained by the account by SUNG Lien; and what reminds one in this connection is the account in the *Ch'i-chêng-t'ui-pu* 七政推步 compiled during the Ming dynasty. The calendar named the *Ch'i-chêng-t'ui-pu* is one of the Hui-hui calendar books and in 7 vols. compiled by Pei-lin 貝琳, assiatant-superintendent of the Nanking Observatory. As to the origin of this books, the last passage in Vol. 1 reads:

"This book did not exist in ancient times. In the 18th year of *Hung-wu* 洪武, when the distant foreigners became naturalized, they presented to the court the foreign calendar. This forecasts eclipses and occultations of six planets. It uses the terms longitudes and latitudes. YÜAN T'ung 元統, the calendar official at that time, removed the foreign terms and converted them into Chinese calculus. Then the book was circulated through China. In the course of many years, it was lost sight of. Ever since I was appointed Assistant-superintendent, I have feared that it would be discarded and its real nature would be lost sight of. In the 6th year of *Ch'êng-hua* 成化, I earnestly entreated the Emperor to cause it to be revised. It is already eight years since the Emperor's permission was obtained. Yet it has not been completed. This autumn in the 13th year of *Ch'êng-hua*, the book is at last completed. I tell the men to proceed to print it, and I preserve it in the Observatory so that I may repay the Emperor's patronage and benefit later scholars by it. Students of astronomy should pay homage to this work."(1)

Thus it seems that the foreign calendar introduced into China in the 18th years of *Hung-wu* (1385 A.D.) was translated into Chinese by YÜAN T'ung, the calendar official at the time, and adopted by the people, and that Pei-lin, fearing that it might be lost, undertook to revise it and completed it in the 13th year of *Ch'êng-hua* (1477 A.D.). This incident corresponds to that recorded under the lst day (the day of *I-wei* 乙未) of the 10th month, the 13 year of *Ch'êng-hua* in the reign of the Emperor Hsien-tsung 憲宗 in the *Ta-ming-shih-lu* 大明實錄 (Vol. 171) which says as follows:

"Pei-lin, the assistant-superintendent of the Nanking Observatory, and others, compiled the printing of the *Ta-t'ung-li* 大統曆 and the *Hui-hui-li* 回回曆 which they had compiled at the Imperial request, and presented them to the court. The Emperor said 'Let the Department of Ceremonies send word and have the block be brought to the capital.'"(2)

Only the *Shih-lu* does not use the term *Ch'i-chêng-t'ui-pu*, but calls it simply *Hui-hui-li*. By the way, for the Chinese phrase *Ch'i-chêng*, the Toyo Bunko copy under *T'ien-wên-men* 天文門 assigns *Sai-ya-la-t'ê* 塞呀剌忒 *saiyārāt* meaning

(1) 此書上古未嘗有也. 洪武十八年, 遠夷歸化, 獻土盤歷法. 預推六曜干犯, 名曰經緯度. 時歷官元統, 去土盤譯爲漢算, 而書始行乎中國. 歲久湮沒. 予任監佐, 每慮廢弛而失眞傳. 成化六年, 具奏修補. 欽蒙准理, 又八年矣. 而無成. 今成化十三年秋而書始備, 命工鋟梓, 傳之監臺, 以報聖恩, 以益後學. 推歷君子, 宜敬謹焉.

(2) 南京欽天監副貝琳等, 奉勅大統曆, 回回曆, 成刊印, 進呈. 上曰, 禮部其移文, 令以刊板送京.

yu-hsing 遊星 (planets). It is thus confirmed that Pei-lin completed the *Ch'i-chêng-t'ui-pu* in the 13th year of *Ch'êng-hua*; but it is not right to hold that the new calendar was imported from the West in the 18th year of *Hung-wu*. This will be discussed later. The *Ch'i-chêng-t'ui-pu* gives the examples of numbers used as follows, at first.

"The whole heaven divided into 12 zodiacal constellations, 360 degrees in total."(1)

"1 zodiacal constellation sign 30 degrees; 1 degree 60 minutes; 1 minute 60 seconds; 1 second 60 *wei* 微; 1 *wei* 60 *hsien* 纖."(2)

And days allotted for zodiacal constellations are given as follows.

Pai-yang-hsü-kung	白羊戌宮	(Aries)	31 days
Chin-niu-yu-kung	金牛酉宮	(Taurus)	31 days
Yin-yang-shên-kung	陰陽申宮	(Gemini)	31 days
Chü-hsieh-wei-kung	巨蟹未宮	(Cancer)	32 days
Shi-tzŭ-wu-kung	獅子午宮	(Leo)	31 days
Shuang-nü-ssŭ-kung	雙女巳宮	(Virgo)	31 days
T'ien-ch'êng-ch'ên-kung	天秤辰宮	(Libra)	30 days
T'ien-hsieh-mao-kung	天蝎卯宮	(Scorpio)	30 days
Jên-ma-yin-kung	人馬寅宮	(Sagittarius)	29 days
Mo-chieh-ch'ou-kung	磨羯丑宮	(Capricornus)	29 days
Pao-p'ing-tzŭ-kung	寶瓶子宮	(Aquarius)	30 days
Shuang-yü-hai-kung	雙魚亥宮	(Pisces)	30 days

"The above 12 zodiacal constellations, — these are the so-called constant months in the Hui-hui calendar, — 365 days in all, the number of days for one yearly circuit. If it should be a leap year, a day should be added to 30 days allotted for Pisces, making the circuit that year in 366 days."(3)

The *Hui-hui-li-fa* 回回曆法, 1, under Li 曆 7, of the *Ming-shih* gives the former as 用數 (numbers used) and the latter 宮日 (days for zodiacal constellations), but the two books agree in the details of explanations. The Hui-hui calendar described in the *Ming-shih*, according to its compilers, was not adopted from one complete book, but seems to have been compiled from various sources. This may be seem from the preface to the *Hui-hui-li-fa* in the *Ming-shih*. As to the 12 zodiacal constellations, they will be further investigated later.

It has been made clear from the foregoing that the *Wan-nien-li* alleged to have adopted 12 zodiacal constellations and 360 degrees was of the same nature as the Hui-hui calendar. As to the *Êrh-shih-pa-hsiu-tz'ŭ-shê* 二十八宿次舍 (visting in succession 28 constellations), nothing could be ascertained neither from the *Ming-shih* nor from the *Ch'i-chêng-t'ui-pu*. The latter contains

(1) 周天計十二宮，共三百六十度.

(2) 每一宮三十度，每一度六十分，每一分六十秒，每一秒六十微，每一微六十纖.

(3) 已上十二宮，即回回歷書所謂不動的月者是也. 共三百六十五日，乃歲周之日也. 若遇宮分有閏之年，於雙魚亥宮之三十日內，又添一日，其年周歲得三百六十六日也.

what it calls *Ling-fan-ju-hsiu-t'u* 凌犯入宿圖 (figure of occultations of constellations) where occurs this account *T'ui-yüeh-yü-wu-hsing-ju-hsiu-fa* 推月與五星入宿法 (method of calculating the entrances into constellations of the moon and the five planets). Whether this did not refer to all the 28 constellations, or only formed a part of the so-called *Êrh-shih-pa-hsiu-t'zŭ-shê* theory, the writer is not a position to determine. Be that as it may, it is beyond doubt that the *Wan-nien-li* and the Hui-hui calendar agreed at least in some part, especially in the fundamental method of computation. The compiler of the *Li-chih* 曆志 (History of calendar) of the *Ming-shih* says as follows:

"A study of the calendar of the Western Regions shows that one prominent in history is the *Chiu-chih-li* 九執歷 of the T'ang dynasty, and another the *Wan-nien-li* by Jamāl ud-Dīn of the Yüan dynasty. The *Chiu-chih-li* is the less accurate. The *Wan-nien-li* was adopted, but not for a long period. The Hui-hui calender alone was recognized as a subject to be investigated under the jurisdiction of the Astronomical Department; and was used interchangeably with the Ta-t'ung calendar for over 270 years. Eclipses and occultations and their degrees are sometimes given falsely, but it is considerably superior to the *Chiu-chih-li* or the *Wan-nien-li*."(1)

The Hui-hui calendar and the *Wan-nien-li* are here given as entirely different in their nature; but should the writer's view presented in the foregoing be accepted, it would follow that the view presented in the *Li-chih* of the *Ming-shih* is an erroneous one lacking in historicity.

It seems that during the Yüan dynasty the calendar of the Western Regions was introduced even prior to that of the *Wan-nien-li*. According to the *Cho-kêng-lu* 輟耕錄 (Vol. 9) by Tao Tsung-i 陶宗儀, Ya-lü Wên-chêng-kung, Ch'u-ts'ai 耶律文正公楚材 noticing the superiority of the calendar of the Western Regions to the Chinese, caused a calendar called *Ma-ta-pa-li* 麻答把曆 to be compiled. The *Cho-kêng-lu* says:

"It was said that the calendar of the Western Regions is the more accurate as to the five planets than the Chinese. So the *Ma-ta-pa-li* has been compiled. This is the name of the Hui-hu 回鶻 calendar."(2)

The *Ma-ta-pa* calendar was thus compiled on the basis of the Hui-hu calendar. There is no way of investigating the original term of *Ma-ta-pa*. Chang Hsing-lang 張星烺, in his *Chung-hsi-chiao-t'ung-shih-liao-hui-pien* 中西交通史料匯編 Vol. IV (p. 279) at once assumes this calendar to be a Persian, without giving any ground for his supposition. Should this Hui-hu 回鶻 were synonymous with Hui-hui 回回, this calendar would be deemed as the forerunner of the Hui-hui calendar introduced to China. A Study of the choice of words in the *Cho-kêng-lu* would prove it rather unreasonable to regard Hui-hu in question and Hui-hui as

(1) 按西域歷術，見於史者，在唐有九執歷，元有札馬魯丁之萬年歷．九執歷最疎．萬年歷行之未久．唯回回歷，設科隸欽天監，與大統參用二百七十餘年，雖於交食之有無深淺，時有出入，然勝於九執，萬年遠矣．

(2) 嘗言．西域曆五星密於中國，乃作麻答把曆．蓋回鶻曆名也．

identical.

It is true that there was the celebrated *Shou-shih-li* 授時曆 during the Yüan dynasty which was compiled by Kuo Shou-ching 郭守敬 under the influence of western calendars. But this also certainly depended much upon the *Hui-hui-li-fa*. What was the *Hui-hui-li-fa* like, then? It has already been pointed out that it especially values the basis of 12 zodiacal constellations and 360 degrees. The account which summarizes the whole character is probably that which occurs under the *Hui-hui-li-fa* in the *Li-chih* of the *Ming-shih*.

"This calendar does not include an intercalary month; a year is composed of 365 days. A year is made up of 12 zodical constellations; zodiacal constellations contain intercalary days. In about 128 years, there occur zodiacal constellations containing 31 intercalary days. Then in 354 days a circuit is made. A circuit is made of 12 months; and months contain intercalary days. In about 30 years, there occur months containing 11 intercalary days. In the course of 1941 years zodiacal constellations, months, days, stars concur again. The above is the outline of this system."(1)

Is it to be inferred from this account that the *Hui-hui-li-fa* was the so-called Mohammedan or lunar calendar? Is the *Hui-hui-li-fa* a perfect lunar calendar, as is so generally supposed? It is a question which requires extremely careful consideration.

According to the account given under *Li-fa-yen-ko* 曆法沿革 (history of calendars) in the *Li-chih* of the *Ming-shih* (Bk. 31), to the post of the superintendent of the Hui-hui Observatory established in the 1st year of *Hung-wu* (1368 A.D.) in the early period of the Ming dynasty, Akhdir (?) 黑的兒 the senior superintendent of the Hui-hui Observatory of the Yüan dynasty, and others were appointed; and next year Cheng 'Alī 鄭阿里 (Chêng 鄭 being a Chinese family name newly adopted) a similar official of the Hui-hui Observatory and others took part in deliberating calendars. It has already been stated that the *Wan-nien-li* by Jamāl ud-Dīn and the *Hui-hui-li-fa* had the same fundamental characteristics in common with each other. From these it may not be wrong to assert that the calendar of the Western Regions of the Yüan dynasty and that of the Ming dynasty were for the most part identical.

The account under the *Hui-hui-li-fa* 回回曆法 in the *Li-chih* of the *Ming-shih* reads:

"The *Hui-hui-li-fa* was compiled by *Ma-ha-ma* 馬哈麻 (Muḥammad), the king of Mo-ti-na 默狄納 (Madīna=Medina).....At the beginning of *Hung-wu* the book was obtained at the Yüan capital. In the autumn of the 15th year (of *Hung-wu*), the Emperor T'ai-tsu 太祖 said. 'The method of computing heavenly phenomena practised in the Western Regions is more accurate than any other. The method of the five planets and latitudes it adopts are unknown

(1) 其法不用閏月，以三百六十五日爲一歲．歲十二宮，宮有閏日．凡百二十八年而宮閏三十一日．次三百五十四日，爲一周．周十二月，月有閏日．凡三十年，月閏十一日．歷千九百四十一年．宮月日辰再會．此其立法之大槩也．

to China. He ordered Li Chung 李翀, Wu Pai-tsung 吳伯宗, members of the Academy, and Ma Sha-i-hêi 馬沙亦黑, the Mohammedan prelate, and others to translate the calendar."(1)

A passage under *Li-fa-yen-ko* in the *Li-chih* of the *Ming-shih* reads:

"In the 9th month, the 15th year (of *Hung-wu*), the Emperor ordered Li Chung, Wu Pai-tsung, members of the Academy, to translate the Hui-hui book of calendar."(2)

So it follows that a study of the *Hui-hui-li-shu* 回回曆書 translated by Ma-sha-i-hêi and others will reveal the outline of the *Hui-hui-li-fa* enforced during the Yüan and Ming dynasties. What was the nature of the *Hui-hui-li-shu?*

As Yasuzô Kanai 金井保三 pointed out a long time ago,(3) the *Li-shu-lei* 曆數類 in the *I-wên-chih* of the *Ming-shih* (Vol. 98) says: 馬沙亦黑回回歷法三卷, "The *Hui-hui-li-fa* in 3 vols. by Ma Sha-i-hêi." As Dr. Haneda 羽田博士 published an article entitled 華夷譯語の編者馬沙亦黑, "Ma Shaikh, the Compiler of the *Hua-i-i-yü*,"(4) in which he pointed out (p. 440) that the *Hui-hui-li-shu* alleged as translated beginning with the 9th month, the 15th year of *Hung-wu* (1382 A.D.) by Ma Shaikh, Li Chung, and Wu Pai-tsung mentioned under the *Li-fa-yen-ko*, in the *Li-chih* of the *Ming-shih* cited above, was nothing but the *T'ien-wên-ching* 天文經 that the Mohammedan book *Ch'ing-chên-shih-i-pu-chi* 清眞釋疑補輯 mentions as translated in the 5th month, the 16th year of *Hung-wu* (1383 A.D.), and it is entirely different from the *Hui-hui-li-fa* in 3 vols. mentioned in the *I-wên-chih;* and that it was probably included among 所著有法象書數篇 "several books on astronomy compiled by him" recorded in the *Ch'ing-chên-shih-i-pu-chi*. The *Ch'ing-chên-shih-i-pu-chi* is, as is well-known, a book on Chinese Mohammedanism compiled in the 6th year of *Kuang-hsü* 光緒 (1880 A.D.) by T'ang Fu-yu 唐傅猷 and others. There are two editions: one in 2 vols. and the other in 1 vol. The original *Ch'ing-chên-shih-i*, according to the original preface given in the *Ch'ing-chên-shih-i-pu-chi*, was compiled by Chin T'ien-chu 金天柱 who was in the office of Han-lin-yüan and held the position of the Ssŭ-i-kuan-cheng-chiao-hsu-pan 四譯館正教序班 in the Academy, and his own preface is dated the 3rd year of *Ch'ien-lung* 乾隆 (1738 A.D.). By the may, the *Ch'ing-chên-shih-i* itself contains no account of the *T'ien-wên-ching*.

As Dr. Haneda points out, the *T'ien-wên-ching* which the *Ch'ing-chên-shih-i-pu-chi* mentions could not be 馬沙亦黑回回歷法三卷, "The *Hui-hui-li-fa* in 3 vols. by Ma Shaikh" mentioned in the *I-wên-chih* of the *Ming-shih*. However, when the professor ascribes this *T'ien-wên-ching* 天文經 to the *Hui-hui-li-shu* mentioned as translated by Imperial order in the 9th month, the 15th year of

(1) 回回歷法,西域默狄納國王馬哈麻所作. (中略) 洪武初, 得其書于元都. (洪武) 十五年秋, 太祖謂, 西域推測天象最精, 其五星緯度, 又中國所無. 命翰林院李翀, 吳伯宗, 同回回太師馬沙亦黑等, 譯其書.

(2) 洪武 十五年九月, 詔翰林李翀・吳伯宗, 譯回回曆書.

(3) Tōyō Gakuhō 東洋学報, Vol. I, p. 431.

(4) Tōyō Gakuhō, Vol. VII, pp. 437–446.

Hung-wu, he seems to go rather wide of the mark. Though lacking in evidence to speak of, this *Hui-hui-li-shu* must surely be 馬沙亦黑回回歷法三卷, "The *Hui-hui-li-fa* in 3 vols. by MA Sha-i-hêi" mentioned in the *I-wên-chih* of the *Ming-shih*.. At least, the *T'ien-wên-ching* was a different book; and the present writer is of the opinion that it should be understood that the translation of the *Hui-hui-li-shu* and the *T'ien-wên-ching* was simultaneously undertaken by the Imperial order. This view will follow.

Now, what may the *T'ien-wên-ching* be? To present the case in due order, the Preface to the *T'ien-wên-ching* included in the *Ching-chên-shih-i-pu-chi* and quoted by Dr. HANEDA will follow.

"In the 5th month, the 16th year of *Hung-wu* MA Sha-i-hêi, the Mohammedan prelate, who was superintendent of the observatory, translated the *T'ien-wên-ching*. The Preface reads: Divine reason makes no manifestation of itself. In creating man, God showed endless mercy. In appreciating God's goodness and requiting gratitude, man's heart knows no bounds. Yea, and the supreme truth stretches between heaven and earth, yet it is obscure and unknown. As a sagacious intellectual man was born, he understood and apprehended the mystery and establishes his theory. As wise men of later times closely succeeded one after another, they received the knowledge handed down from ancient sages, and left it to posterity. Muhammad 穆罕默德 the sage and later sages came in succession. Their services in this great truth should be regarded as brilliant. *Ya-êrh* 牙耳 a great sage with vast knowledge and intelligence appeared, and raised the most profound theories, compiling the present book. The utmost accuracy and profundity are herein stored. Later scholars should rely upon this with respect and even men of the great intellect should not be able to add new theories to it or supersede the theories."(1)

Furthermore, the *Ch'ing-chên-shih-i-pu-chi* has another preface after the one just cited. It is the preface to the *Hui-hui-t'ien-wên-shu* 回回天文書 by WU Pai-tsung who was Inspector of the Academy; and there is no doubt whatever as to the identity of this *Hui-hui-t'ien-wên-shu* and *Ti'en-wên-ching*. According to this later preface, in the 9th month, the 15th year of *Hung-wu*, the Emperor ordered WU Pai-tsung and LI Chung, members of the Academy, to translate the calendar of the Western Regions because of its superiority and of the benefit it would render to the government; and they summoned Haidar (?) 海達兒, Adā ud-Dīn 阿答兀丁 men from the Western Regions and the Mohammedan prelate MA Sha-i-hêi, Mahmad (?) 馬哈麻 and made them translate the book. The whole preface is cited here in spite of its great length.

"On the day *hsin-hai* 辛亥 of the 5th month, the 16th year of *Hung-wu*,

(1) 洪武十六年五月，欽天監回回太師馬沙亦黑，譯天文經. 序云，天理無象，其生人也. 恩厚無窮. 人之感恩而報主也，心亦罔極. 然而大道在天地間，茫昧無聞. 必有聰明睿智者出，心得神會斯道之妙，立教於當世. 後之賢者，接踵相承，又得上古聖人所傳之妙，以垂教於來世也. 聖人穆罕默德，及後賢輩出，有功於大道者，昭然可考. 逮闕讖牙耳大賢者出，闡揚至理，作爲此書，極其精妙. 後人恪守尊崇，縱有明智，不能加規而過矩也.

Wu Tsung-pai (this should read Wu Pai-tsung 伯宗), Inspector of the Academy, translated the *Hui-hui-t'ien-wên-shu*. The preface reads: The Emperor reigns over all Chinese and alien peoples by enjoying the gracious order of Heaven. Laws of the Empire are enforced throughout the realm, and all kinds of culture advance wide and fair. As the grand general conquered the Yüan capital at the beginning of *Hung-wu*, he captured several *wan* 萬 (10,000) volumes of records, books of Confucianism, commentaries, writings by sages, histories; he brought every one of them to our capital and placed them in the Emperor's library.(1) In his leisure amidsts the crowded government affairs, the Emperor summoned scholars of his court to lecture to him, for the purpose of improving his government. Among the masses, there were several hundred books from the Western Regions; the language was foreign, the contents unfamiliar, and no one could read them. On the day of *kuei-hai* 癸亥 of the 9th month, in the autumn of the 15th year of *Hung-wu*, the Emperor drove to the Fêng-t'ien-men 奉天門, and summoned Li Chung, member of the Academy, and me, Wu Tsung-pai 吳宗伯 (this should read Pai-tsung 伯宗) and admonished us saying 'Heaven's will is profound and mysterious; He instructs man by manifesting phenomena. If a ruler of men should behave in accordance with His will, he would succeed in government. The emperors of old looked up and studied astronomy and looked down and surveyed geography, thus managing human affairs and cherishing all creatures. For this reason, books came out in great quantities, and morality was enhanced. The astronomers of the Western Regions have always been known to be extremely accurate and reliable in their calculations of heavenly phenomena. Especially, their method of latitudes is what is not known in China yet. This must considerably affect heaven and men. You should certainly translate the books and study them at times. It is our wish that one should look at heavenly phenomena and reflect on oneself and cultivate virtues; thinking of evils, one should take precautionary measures; observing Heaven's will, one should promote the welfare of the people.' So it was decided to summon to the court Ling-t'ai-lang 靈臺郎 in the Astronomical Department Haidar (?) 海達兒, Adā ud-Dīn 阿答兀丁, the Mohammedan prelate Ma Sha-i-hêi 馬沙亦黑, and Mahmad (?) 馬哈麻. Selecting the books on astronomy, astrology, and calendar, the Emperor ordered them to translate one after another, saying 'You are men from the Western Regions who know each proper language and are also versed in Chinese. You must orally explain to the Chinese scholars and they will translate the meaning and compose it into writing. Don't colour your statement or be careless about it. We, subjects, faithfully obeyed the Imperial request. Opening a bureau to the right of the Yu-shun-mên 右順門, they worked assiduously to comply with

(1) An opening passage in the *I-wên-shih* 1, of the *Ming-shih* (Bk. 96), reads 明太祖定元都, 大將軍收圖籍, 致之南京 'As the T'ai-tsu of the Ming dynasty conquered the Yüan capital, the grand general captured books and records and brought them to Nanking.

the Imperial desire, without adding or subtracting even the most trifling point. The following year (the 16th year of *Hung-wu*), the translation of the astronomical word was completed; after making a fair copy, they presented it to the Emperor. He ordered (me), Tsung-pai 宗伯=Pai-tsung to write a preface. I, the humble subject, have heard that Fu-hsi 伏羲 achieved augury; T'ang-yao 唐堯 compiled calendar; Ta-shun 大舜 completed astronomy, and Shên-yü 神禹 formulated nine provinces. Generation after generation, the books were handed down and gradually increased. They most precisely and extensively state the changes of heaven and earth, interrelations of the *Yin-yang* principles, the movements of sun, moon and stars, the order and succession of cold and heat and day and night, the future of human affairs, and the natural phenomena and the state of things; which are both extremely delicate and tremendous. As I study this calendar of the Western Regions, it is found to take a process different from the Chinese and to arrive at the same result, and it is thus proved that the universe is filled with mystery of the supreme reason and delicacy. What difference could there be between the East and the West? It is my humble opinion that the Emperor's prayer reaches heaven, and learning follows ancient precepts. Each word, each deed is solemn just as the reflex of the will of august diety above. As to ceremony and music, law and government, they are advanced at the positive time and settled at the negative one, only when one behaves in accordance with the will of heaven and depends upon the natural order of the sun, the moon and the five planets and the harmony of wet and dry weather; and one thus may contribute to a reign of peace and prosperity. Our Emperor worships heaven and let the people endeavour taking pains like Fu-hsi, Yao 堯, Shun 舜, Yü 禹 and T'ang 湯. That principle of harmony between heaven and man, which records and biographies all tend to illustrate, lies in the heart of man in detail. The translation of this book is now completed, and preserved for the Emperor to peruse. One should always try to be sincere in one's efforts. If it is so, it may be possibly perfect. This book originates from the divine descendants of Arabia. During over a hundred years, during Yüan dynasty it was obscure and unknown. Now, it is discovered by the Emperor's grace, and is brought to light to serve China, and to become a guidance for governing each family. What a blessing it is! The Emperor's mind is serene and exceedingly just. He treats all men alike, making no discrimination. He immensely transcends his predecessors. This book is mentioned and designated for preservation. It is to be handed down and used together with the books by Chinese sages and scholars. It would not only benefit the present world, but also serve all posterity."(1)

(1) 洪武十六年五月辛亥，翰林檢討吳宗伯（伯宗の譌）譯回回天文書．序曰，皇上寔天明命，撫臨華夷．車書大同，人文宣朗．爰自洪武初，大將軍平元都，收其圖籍經傳子史，凡若干（千の譌）萬卷，悉上進京師，藏之書府．萬幾之暇，卽召儒臣進講，以資治道．其間西域書數百册．言殊事異，無能知者．十五年秋九月癸亥，上御奉天門，召翰林院李翀・臣吳宗伯（伯宗の譌）．而諭之曰，天道幽微，垂象以示人．人君體天行道，乃成治功．古之帝王，仰觀天文，俯察地理，以

The origin of the so-called *Hui-hui-t'ien-wên-shu* may be grasped by the foregoing preface. Whence, then, did the *Ch'ing-chên-shih-i-pu-chi* obtain these two prefaces? Unless they are compositions by the compiler, they must be based upon some source. The *Tsan-sung-pei-chi-hsü-shuo* 讚頌碑記序說 in the famous *T'ien-fang-chih-shêng-shih-lu* 天方至聖實錄 (Vol. 20) by Liu Chih 劉智. It is not to be doubted that this book was printed after the middle of the reign of the Emperor Ch'ien-lung. But it had already been composed before the 2nd year of *Yung-chêng* 雍正 (1724 A.D.). It contains them as the Preface to the *Hui-hui-t'ien-wên-shu* and the Preface to the *Hui-hui-t'ien-wên-ching*, ascribing the former to Wu Pai-tsung, and the latter to Ma Sha-i-hêi. The compiler of the *Ch'ing-chên-shih-i-pu-chi* must surely have reprinted them from this compilation. However, the *Chih-shêng-shih-lu* 至聖實錄 must have had something to go by. The present writer is convinced that he must have ascribed to it the book entitled *Ming-i-t'ien-wên-shu* 明譯天文書 (Astronomy translated during the Ming dynasty).

A glance at the *Ming-i-t'ien-wên-shu* in 3 vols. and 4 branches included in the *Han-fên-lou-pi-chi-ts'ung-shu* 涵芬樓秘笈叢書 will show the two compositions given at the opening to be almost identical with the two prefaces in question, excepting that the preface to the *T'ien-wên-ching* ascribes to 馬沙亦黑 in the *Chih-shêng-shih-lu* and the *Ch'ing-chên-shih-i-pu-chi* is given without the compiler's name in the *Ming-i-t'ien-wên-shu*, only entitled the Preface to the *Tien-wên-shu*, and moreover without the date, and that for 報主 in the *Pu-chi* reads 報天, for 聰明睿智者, 聰明睿智聖人者, for 穆罕默德, 馬哈麻 and for 恪守, 信守, not a single word being added or subtracted in other respects. The *Chih-shêng-shih-lu* has one and the same text, only reading 穆罕默德 for 馬哈麻 in the *Ming-i-t'ien-wên-shu* and 恪守 for 信守, only giving at the end the date the day of *hsin-hai* 辛亥 of the 5th month, the 16th year of *Hung-wu* 洪武.

And the *Chih-shêng-shih-lu* gives the *Hui-hui-t'ien-wên-shu-hsü* 回回天文書序 (the Preface to the *Hui-hui-t'ien-wên-shu*) and the *Ch'ing-chên-shih-i-pu-chi* 譯回回天文書序, (the Preface to the Translation of the *Hui-hui-t'ien-wên-shu*), but it

修人事育萬物. 由是文籍以興, 彝倫攸敍. 邇來西域陰陽家, 推測天象, 至爲精密有驗. 其緯度之法, 又中國書之所未備. 此其有關於天人甚大. 宜譯其書以時披閱, 庶幾觀象, 可以省躬修德, 思患預防, 順天心, 立民命焉. 遂召欽天監靈臺郎臣海達兒・臣阿答兀丁・回回太師臣馬沙亦黑・臣馬哈麻等, 咸至於廷. 出所藏書, 擇其言天文・陰陽歷象者, 次第譯之. 且命之曰, 爾西域人素習本音, 兼通華語. 其口以授儒, 中儒譯其義, 緯成文焉. 惟直述毋藻繪, 毋忽. 臣等奉命唯謹. 開局於右順門之右, 相與切磨遠厥本旨, 不敢有毫髮增損. 明年 (洪武十六年) 天文書譯就, 繕寫以進. 有旨, 命臣宗伯 (伯宗の譌) 爲序. 臣聞, 伏羲畫八卦, 唐堯欽歷象, 大舜齊七政, 神禹敍九疇, 歷代相傳, 載籍益備. 其言天地之變化・陰陽之闔闢・日月星辰之運行・寒暑晝夜之代序, 與夫人事吉凶・物理消長, 微妙宏衍矣. 今觀西域天文書, 與中國所傳, 殊途同歸. 則知至理精微之妙, 充塞宇宙. 豈以東西而有間乎. 恭惟皇上心與天通, 學稽古訓. 一言一動, 森若神明在上. 凡禮樂刑政, 陽舒陰斂, 皆法天而行, 期於七曜順度, 雨暘時若, 以致隆平之治, 皇上敬天勤民, 卽伏羲堯舜禹湯之用心也. 經傳所載, 天人感應之理, 存於方寸者矣. 今又譯成此書, 常留睿覽, 兢兢戒愼, 純亦不已. 若是其至哉. 是書遠自天方聖裔. 在元世百有餘年, 晦而弗顯. 今遇聖明, 表而爲中國之用, 修一家之言. 何其幸也. 聖心朗焉大心, 一視無閒. 超軼前代遠矣. 列而存之. 與中國聖賢之書, 並傳並用. 豈惟有補於當今. 亦有功於萬世云.

is given as 譯天文書序 (the Preface to the Translation of the *T'ien-wên-shu*) in the *Ming-i-t'ien-wên-shu*; and for 吳宗伯 in the *Ch'ing-chên-shih-i-pu-chi* is in all others given 吳伯宗 (which is of course the right name), 若干萬卷 for 若干萬卷, 翰林臣李翀 for 翰林院李翀, 廷 for 庭, 授儒爾儒繹其義 for 授儒中儒譯其義, 越明年二月 for 明年二月, 弘衍 for 宏衍, 華夷 for 東西, 出夷裔 for 自天方聖裔, 備一家之言 for 修一家之言, 廓焉 for 朗焉, 刻而列之 for 列而存之, removing the date at the beginning to the end as 洪武十六年五月辛亥, 翰林檢討臣吳伯宗謹序. The *Chin-shêng-shih-lu* has for these words and phrases 吳伯宗, 翰林臣李翀, 庭, 授儒爾儒譯其義, 明年二月, 弘衍, 東西, 出天方聖裔, 備一家之言, 朗焉, 列而存之, definitely proving that it lies half-way between the *Ming-i-t'ien-wên-shu* and the *Ch'ing-chên-shih-i-pu-chi*. Seeing that the two prefaces in these three books differ in such trifling points, one may infer that they were originally one and the same thing and, in the view of the differences in the sections cited above from the three books and the differences in the dates at which the *Ming-i-t'ien-wên-shu*, the *T'ien-fang-chih-shêng-shih-lu*, and the *Ch'ing-chên-shih-i-pu-chi*, it may be asserted that the preface in the *T'ien-fang-chih-shêng-shih-lu* was certainly reprinted from the *Ming-i-t'ien-wên-shu*, and that in the *Ch'ing-chên-shih-i-pu-chi* in turn was based on the *T'ien-fang-chih-shêng-shih-lu*. And the reason why the *T'ien-wên-ching-hsü-wên* 天文經序文 which the *T'ien-fang-chih-shêng-shih-lu* and the *Ch'ing-chên-shih-i-pu-chi* ascribe to MA Sha-i-hêi, is given ās merely *T'ien-wên-shu-hsü* 天文書序 in the *Ming-i-t'ien-wêu-shu* may be that this being a preface by MA Sha-i-hêi himself who was in the position of the chief ranslator, the did not attach the name of the compiler. So when the *T'ien-fang-chih-shêng-shih-lu* and the *Ch'ing-chên-shih-i-pu-chi* ascribed this preface to MA Sha-i-hêi 馬沙亦黑, they should not be accused of committing an absurd blunder. For this preface does not seem to be one attached to the original text which was translated, but merely one for translating. However, when the *T'ien-fang-chih-shêng-shih-lu* and the *Ch'ing-chên-shih-i-pu-chi* treat them as two distinct books, mentioning one as the *T'ien-wên-ching* 天文經 and the other to which WU Pai-tsung 吳伯宗 wrote a preface as the *Hui-hui-t'ien-wên-shu*, the present writer cannot agree with them. The exact title *Ming-i-t'ien-wên-shu* meant a scripture on the part of the Mohammedans, and therefore it was entitled *T'ien-wên-ching* 天文經 (A scripture on astronomy); and from the standpoint of ordinary Chinese like WU Pai-tsung and others, it was only natural to call it the *Hui-hui-t'ien-wên-shu* suggesting an exotic nature in the title; yet it is not certain from what date these came to be differentiated. The *T'ien-fang-chih-shêng-shih-lu* already made this distinction, adopting the epithet Hui-hui to treat it as if it were two distinct books.

According to the preface by WU Pai-tsung, this *T'ien-wên-shu* seems to have also resulted from the Imperial request of the 9th month, the 15th year of *Hung-wu*; it was the same Imperial request recorded under the *Li-fa-yen-ko* 曆法沿革 (History of calendars) and the *Hui-hui-li-fa* 回回曆法 in the *Li-chih* 曆志 of the *Ming-shih*, which empowered LI Chung and WU Pai-tsung of the

Academy to translate the Hui-hui calendar with MA Sha-i-hêi. If we should interpret it to mean that the Hui-hui calendar alone was translated at that time, it would be a different issue. The present writer is of the opinion that the Islam books captured at the Yüan capital in the 1st year of *Hung-wu* amounted to several hundred, as is shown in the above-cited *I-t'ien-wên-shu-hsü* (the Preface to the translation of the *T'ien-wên-shu*). No, it was not the calendar alone that was translated. For this reason, one could not depend upon the account in the *Li-chih* of the *Ming-shih*. However, the passage under *Hsiü-ming-li-fa* 修明曆法 in the *Ming-shih-chi-shih-pên-mo* 明史紀事本末 (Vol. 73) reads:

"In the 15th year (of *Hung-wu*), the Emperor ordered WU Pai-tsung 吳伯宗, who was Ta-hsüeh-shih 大學士, and others to translate the Hui-hui calendar, and various books on longitudes and latitudes and astronomy."(1)

So the preface which says that it was not only the Hui-hui calendar but various books on longitudes and latitudes and astronomy that WU Pai-tsung and others were ordered to translate, would seem to reveal the truth of the matter. As one of the books relative to astronomy, the *Ming-i-t'ien-wên-shu* in question was translated into Chinese. For the purpose of unifying the business of translation, a bureau was founded, as shown in the preface by WU Pai-tsung, to the right of the Yu-shun-mên 右順門, and LI Chung and WU Pai-tsung were appointed compilers and Haidar 海達兒, Adā ud-Dīn 阿答兀丁, MA Sha-i-hêi and Maḥmad 馬哈麻 were placed in charge of actual translation.

Another matter which requires consideration is the Imperial message given to MA Sha-i-hêi, the Mohammedan prelate, and Maḥmad 馬哈麻 in the 15th year of *Hung-wu* as recorded in the *Ch'ing-chên-shih-i-pu-chi*. As has already been pointed out by Dr. HANEDA, this message and the *Han-lin-pien-hsiü MA Sha-i-hêi Ma-ha-ma Ch'ih-wên*. 翰林編修馬沙亦黑馬哈麻勅文 "The Imperial message to the editor of the Academy, MA Sha-i-hêi Ma-ha-ma" are almost identical except in a few characters.(2) Dr. HANEDA has questioned the *Ch'ing-chên-shih-i-pu-chi* when it ascribes this Imperial message to the 15th year of *Hung-wu*; and from the account on compiling the *Hua-i-i-yü* in the *Ta-ming-shih-lu* under the day of *ping-hsü* 丙戌 of the 1st month, the 15th year of *Hung-wu*, which already mentions Mashaikh as Pien-hsiü 編修 (Editor), he has contended that the Imperial message must be dated prior to the 15th year of *Hung-wu*.(3) He is certainly right in his view. By the way, before it was included in the *Ch'ing-chên-shih-i-pu-chi*, this Imperial message was printed in the *T'ien-fang-chih-shêng-shih-lu* entitled *Chih-hui-hui-t'ai-shih-wên* 勅回回太師文 (Imperial Message to the Hui-hui Prelate) and under the 15th year of *Hung-wu*. It would follow, therefore, that if the date in the *Ch'ing-chên-shih-i-pu-chi* was an error, the *T'ien-fang-chih-shêng-shih-lu* should be held responsible for it. For reference,

(1) (洪武) 十五年, 命大學士吳伯宗等, 譯回回曆・經緯度・天文諸書.
(2) *op. cit.* Tōyō Gakuhō, Vol. VII, p. 438.
(3) *ibid.*, p. 439.

the Imperial message will be cited here from *Kao-huang-ti-yü-chih-wên-chi* 高皇帝御製文集 (Collection of compositions by the Emperor Kao-huang *i. e.* Hung-wu).(1)

"We hear that should the ideal of a ruler be realized, it would be the supreme blessing. Should the ideal of a ruler not be followed, it would be a misfortune. Unless it be the right ideal it should not be realized. If a ruler should fall short of this, the ideal would be suspended for some time. As to the writing of China, this country of ours first tied knots of rope came to be superseded by the eight symbols, and then by bamboo tallies; and as square books were finally invented, they were circulated and diffused. There is no precept of ancient sages but is included. There is no characteristic of a matter, no work of nature but is fully considered. In the early years of *Hung-wu*, the general entired the Yüan capital and seized the books which were all to be considered. Only several hundred books of the most valued were those by ancient sages of Arabia; but there was no man in our country who could interpret the writings. We hear that you belong to the orthodox school and that you are thoroughly versed in its details. We ordered you to translate the books. The philosophy you have translated during these several months, we now acknowledge, interprets all truths and mysteries. Their theory of measuring heaven is extremely precise and detailed. Oh, how valuable the Arabian books are! But for you, who would be able to distinguish himself in China? Unless you write down, who would be able to win a fame of an immortal sage? We hereby appoint you editor of the Academy. We desire that you will prove yourself faithful."(2)

The *Ch'ing-chên-shih-i-pu-chi* has 大將入都 for 大將入胡都, 測主之道 for 測天之道, 乾方之秘書 for 乾方之書秘書, 明於中國 for 名於中國, and 欽哉 for 敬哉 as has been collated by Dr. HANEDA. The *T'ien-fang-chih-shêng-shih-lu* follows by the suit of the *Ch'ing-chên-shih-i-pu-chi* except in only one place where it reprints the original phrase 測天之道, rejecting 測主之道 in the *Ch'ing-chên-shih-i-pu-chi*. The *T'ien-fang-chih-shêng-shih-lu* reprints it from the *Kao-huang-ti-wên-chi* 高皇帝文集, while the *Ch'ing-chên-shih-i-pu-chi* quotes it from the *Chih-shêng-shih-lu*, deliberately changing some words or carelessly committing errors in printing. This Imperial message is one which appoints Ma-sha-i-hêi and others editors of the Academy in recognition of the services in translating an Islam book. What they had translated, it does not say. From the passage: 今數月所譯之

(1) The Imperial message in question is included in the Shêng-chih 聖製 (Imperial compositions) Pt. 2 in the *Huang-ming-shih-fa-lu* 皇明世法錄, Vol. XII. That and this one quoted here are identical.

(2) 朕聞, 君子之道行, 是爲萬幸. 君子之道不行, 是爲不幸. 非道不行也. 乃是君子之不才, 致道有滯於一時. 吾中國之文, 始八卦以代結繩, 而編簡至於方册流傳. 古聖人之言, 莫不備載. 萬物性情, 造化無所不該焉. 洪武初, 大將入胡都, 所得圖籍, 文皆可考. 惟祕藏之書數十百册, 乃乾方先聖之書. 我中國無解其文者. 聞爾道學本宗, 深通其理. 命譯之. 今數月所譯之理, 知上下, 察幽微. 其測天之道, 甚是精詳. 於戲, 乾方之書祕書. 非爾, 安能名於中國. 爾非書, 安能名不朽之智人. 勑命爾爲翰林編修. 汝其敬哉.

理, 知上下, 察幽微. 其測天之道, 甚是精詳, it may be supposed that the book was relative to astronomy or astrology. By the way *Ch'ing-chên-shih-i-pu-chi* commits the same mistake in changing the passage in the original Imperial message 其測天之道 to 其測主之道 as that of changing *t'ien* 天 to *chu* 主 in the passage: 人之感恩而報天也. 心亦罔極, in the Preface to the *T'ien-wên-shu*. This could not be supported. The reason why 天 is corrected to 主 is based on the fact that Allāh, the only deity the Chinese Mohammedans worshipped was called 天 (Heaven) or 主 (Chên-chu 眞主) Lord (True Lord). In view of the frequent presence of 眞主 and 主 during the Ch'ing dynasty, the compiler of the *Ch'ing-chên-shih-i-pu-chi* must have made such changes indiscriminately. The adoption of 主 would not fit the original context.

It is now clear that the book, in recognition of translating which MA Sha-i-hêi and others were appointed editors of the Academy, was a book relative to astronomy. Was this Imperial message awarded after translating the *T'ien-wên-shu* and the Hui-hui calendar? The fact that MA Sha-i-hêi was in the position of editor of the Academy already in the 1st month, the 15th year of *Hung-wu* is, as already pointed out, established by the account in the *Ta-ming-shih-lu* 大明實錄. It would not stand to reason to alter this and assert that he was given the position of editor only after the completion of the translation of the *Li-shu* and the *T'ien-wên-shu* which he was ordered by the Emperor to translate in the 9th month, the 15th year of *Hung-wu*. Furthermore, the fact that in the 9th month, the 15th year of *Hung-wu* Haidar(?) 海達兒 and others had already been in the position of Ling-t'ai-lang 靈臺郎 of the observatory, may be clearly seen in the preface by WU Pai-tsung entitled 譯天文書序 quoted previously. The biography of Ma-sha-i-hêi in the *Ch'ing-chên-shih-i-pu-chi* makes a ridiculous mistake in stating.

"In the 3rd year of *Yung-lo* 永樂 (1405 A. D.), he entered Yen-ching 燕京 in the suite of the Emperor. He was given the position of Ling-t'ai-lang of the observatory."(1)

The present writer is convinced that MA Sha-i-hêi was appointed Ling-t'ai-lang after assisting Huo Yüan-chieh 火原潔 in compiling *Hua-i-i-yü* in the early part of the 15th year of *Hung-wu*.

The biography of Ma-sha-i-hêi in the *Ch'ing-chên-shih-i-pu-chi* which asserts his coming to China accompanied by CH'ÊN Ch'êng 陳誠 the Chinese envoy, could not be relied upon. Dr. HANEDA is certainly right in holding that MA Sha-i-hêi came to China from Samarqand 撒馬兒罕 during the last part of the Yüan dynasty and served the Yüan court, and after the overthrow of the Yüan dynasty and the rise of the Ming dynasty, he served the new court with other Mohammedans.(2) If this be the case, it would not be unreasonable to infer his participation in some undertakings even prior to his compilation of the *Hua-i-i-yü* at the beginning of the 15th year of *Hung-wu*, and his translation

(1) 永樂三年, 隨駕燕京, 授欽天監五官靈臺郎.
(2) HANEDA, *op. cit.*, pp. 441 ff.

of the Hui-hui calendar, and an astronomy relative to longitudes and latitudes which he undertook after the autumn of the same year. His biography in the *Ch'ihg-chên-shih-i-pu-chi*, though a somewhat careless record, might be noted, if it should contain any truth.

"The Emperor Kao-huang-ti (*i.e. Hung-wu*) was greatly surprised at this, and ordered him to construct the celestial globe and correct the gain and loss of the previous generations. The Emperor awarded upon him the degree of *k'o-lou* 刻漏 (this should read *lou-k'o* 漏刻 or horology) *po-shih* 博士 (Doctor of horology). He published several books on astronomy. The Emperor praised him twice, awarding prizes upon him. Creating a special department called *Hui-hui Po-shih-k'o* 回回博士科 (Department of Hui-hui Doctors), the Emperor appointed officials those foreigners who had come with Ma-sha-i-hêi. And he ordered Liu Chi 劉基 and Wu Tsung-pai (this should read Pai-tsung 伯宗) to translate his books."(1)

Thus, apart from the task of translation in which Wu Pai-tsung and others were engaged, when he was probably Docter of horology, he is said to have published several books on astronomy and the Emperor praised him twice, awarding prizes upon him. Does it not follow from this that in recognition of his services during the period when he was Doctor of horology, he was awarded the Imperial message and appointed editor of the Academy? Unless so interpreted, this matter would be more and more complicated and apart further and further from the truth.

As to the biography of Ma Sha-i-hêi, nothing would be added to the above-mentioned article by Dr. Haneda entitled "Ka-i-yaku-go no Hensha Ma Shaikh 華夷譯語の編者馬沙亦黑 (Ma Shaikh, compiler of Hua-i-i-yü)." Only a few words may be said on the original form of his name. In the Imperial message of the Emperor *Hung-wu*, as already mentioned, his name occurs as 馬沙亦黑馬哈麻, and as he is addressed in the Imperial message by 爾 or 汝 a term in the form of the singular second person, it would seem quite reasonable to take *Ma-sha-i-hêi-ma-ha-ma* 馬沙亦黑馬哈麻 as the name of a single person. For this reason, Dr. Haneda assumed the original name to be Ma Shaikh Muhammad.(2) However, a passage in the biography of Ma-sha-i-hêi in the *Ch'ing-chên-shih-i-pu-chi* which Dr. Haneda also quoted reads:—

"Wu Liang 吳諒 of the Ming dynasty. The original name was 馬沙亦黑. He was a native of the province of Samarqand."(3)

Thus the original name is given as Ma Sha-i-hêi 馬沙亦黑 and not accompanied by the three ideographs 馬哈麻. As the account in the *Ch'ing-chên-shih-i-pu-chi* could not be completely relied upon, it would surely be dangerous to assert 馬沙亦黑 alone to represent the original name. And as the preface by Wu

(1) 高皇帝深奇之，命制渾天儀，以正前代得失. 授爲刻漏 (漏刻の譌) 博士. 所著法象書數篇. 帝褒奬者再. 外特設回回博士科，以官其僧來者. 並命劉基，吳宗伯 (伯宗の譌) 譯其經.

(2) *op. cit.*, p. 440.

(3) 明，吳諒，原名馬沙亦黑，撒馬兒罕國人也.

Pai-tsung included in the *Chih-shêng-shih-lu,* the *Ch'ing-chên-shih-i-pu-chi,* and the *Ming-i-t'ien-wên-shu* 明譯天文書 contains a phrase reading 回回太師臣馬沙亦黑臣馬哈麻 Hui-hui prelate (*ch'ên* 臣=Subject) 馬沙亦黑, (Subject) 馬哈麻, 馬沙亦黑 and 馬哈麻 would now seem to be two distinct persons.

There would be no serious objection to interpreting 馬哈麻 as Muḥammad. Only it may be argued that this word was used for transcribing Maḥmad or Maḥmūd in some cases. On the other hand, the writer would object to the view which holds 馬沙亦黑 (MA Sha-i-hêi) to be the transcription of the original name. Every one knows that *shaikh* is an Arabic and a Persian derived from it and that it means 'elder, prelate, professor, authority.' The three letters *sha-i-hêi* 沙亦黑 must be the transcription of this word. The *Li-chih* of the *Ming-shih* and the *Ch'ing-chên-shih-i-pu-chi* give his name as Hui-hui-t'ai-shih Ma-sha-i-hêi 回回太師馬沙亦黑; the reason why in the case of 馬沙亦黑 alone the honorific title 回回太師 (Shaikh al-Islām *i. e.* Mohammedan prelate) is attached is because it surely meant 沙亦黑 (Shaikh). Though the *Ming-i-t'ien-wên-shu* 明譯天文書 says 回回太師. 臣馬沙亦黑. 臣馬哈麻, using a full stop after 回回太師, it would seem more reasonable to strike it off as the *Ch'ing-chên-shih-i-pu-chi* does. Now, as to the identity of the ideograph 馬, it is evident that, like *ma* 馬 the commonest family name among the Chinese Mohammedans to-day, it is the abbreviation of the transcription of such original names as *Muḥammad, Maḥmad, Muḥmūd,* etc. Therefore his whole name introduced to China was Shaikh Muḥammad, Shaikh Maḥmad which probably meant Prelate (or Elder, Shaikh al-Islām) Muḥammad. The reason why the name was handed down as 馬沙亦黑馬哈麻, as if it were the name of one person is probably because, of the two names 馬沙亦黑 and 沙亦黑馬哈麻, the latter form was adopted, yet the ideograph 馬 in the phrase 馬沙亦黑 was retained. In the Persian-English Dictionary by STEINGASS, no such word as *mashaikh* is found. The nearest approach is *mashaikh* the plural form of *shaikh.* Dr. KUWABARA took 馬沙亦黑 to be the transcription of *mashâyikh.*(1) It is true, this fits the transcription very happily. However, *mashâyikh* or *mashâikh* is the plural form of the above-mentioned *shaikh.* The plural form as an honorific might be possible. But may not the singular form be the more appropriate? For this reason, the present writer's view as to the name 馬沙亦黑 may be the most reasonable.

The *Ming-i-t'ien-wên-shu,* as previously stated, is in 3 vols. and 4 branches, while 馬沙亦黑回回曆法 (MA Shaikh's *Hui-hui-li-fa*) included in the *I-wên-chih* 藝文志 of the *Ming-shih* is also in 3 vols. This quantitative agreement may be a mere coincidence. The present writer is of the opinion that they are two entirely different works. And as has been pointed out, MA Shaikh's *Hui-hui-li-fa* in 3 vols. corresponds, not to the *T'ien-wên-ching,* but to the *Hui-hui-li-shu* 回回曆書 translated in the 15th year of *Hung-wu* at the Emperor's request, some explanation of this *Hui-hui-li-shu* is used now.

The compiler of the *Ssŭ-k'u-ch'üan-shu-t'i-yao* 四庫全書提要 says on the

(1) KUWABARA, *Tōyō-bummei-shi Ronsō* 東洋文明史論叢, *op. cit.,* p. 417.

previously mentioned *Ch'i-chêng-t'ui-pu* 七政推步 of Hui-hui calendar, as follows:

"The *Ch'i-chêng-t'ui-pu* in 7 vols, is a compilation by Pei-lin in the position of Assistant Superintendent of the Astronomical Department at Nanknig during the Ming dynasty, which is the 回回曆 (*Hui-hui-li*) by MA Sha-i-ho 瑪沙亦赫 (馬沙亦黑 in the original) included in the *Kuo-shih-ching-chi-chih* 國史經籍志 by CHIAO Hung 焦竑."(1)

Thus the *Ch'i-chêng-t'ui-pu* 七政推步 and the Hui-hui calendar by MA Shaikh are considered to be one and the same book. Is this view to be accepted? The previously quoted postscript by Pei-lin himself says:—

"This book did not exist in ancient times. In the 18th year or *Hung-wu*, when the distant foreigners became naturalized, they presented to the court the foreign calendar. This forecasts eclipses and occultations of six planets. It uses the terms longitudes and latitudes. YÜAN T'ung 元統, the calendar official at that time removed the foreign terms and converted them into Chinese numbers. Then the book was circulated through China."(2)

This seems to prove that the book has no connection whatever with the *Hui-hui-li-fa* by MA Shaikh. Furthermore, this postscript says that in the 18th year of *Hung-wu*, the foreign calendar was for the first time introduced into China and only after its translation into Chinese by YÜAN T'ung 元統, the calendar official at the time, it came to be popularized in China. This account, however, reads very doubtful. The compiler of the *Ssŭ-k'u-ch'üan-shu-t'i-yao* points out that it is contradictory with accounts in various historical works, and goes on to say:—

"There occurs in this book a passage which says that the number of years that elapsed from the founding Arabia to the year of *chia-tzŭ* 甲子 of *Hung-wu* is such and such. The year of *chia-tzŭ* corresponds to the 17th year of *Hung-wu*. By that time the book had already been translated. So it follows that the view held Lin 琳 was mistaken."(3)

Thus the view by Pei-lin 貝琳 is rejected as a faulty one.

What has been pointed out by the *T'i-yao* 提要 certainly must be supported. The opening passage of the *Ch'i-chêng-t'ui-pu* (Vol. 1.), under *Shih-hui-hui-li-fa-chi-nien* 釋回回歷法積年 states:—

"The year of 'Arabī 阿剌必 (Arabia) fixed the year *chi-wei* 己未 of *K'ai-huang* 開皇 as its first year. It is 786 years previous to the year of *chia-tzŭ* of *Hung-wu*."(4)

Therefore, it is by no means reasonable to date the *Ch'i-chêng-t'ui-pu* as originating from the translation in or after the 18th year of *Hung-wu*. The

(1) 七政推步七卷，明南京欽天監監副貝琳修輯，卽焦竑國史經籍志所載瑪沙亦赫 (原作馬沙亦黑) 之回回曆也.

(2) 此書 (七政推步) 上古未嘗有也. 洪武十八年，遠夷歸化，獻土盤歷法. 預推六曜干犯，名曰經緯度. 時歷官元統，去土盤譯爲漢算. 而書始行乎中國，

(3) 書 (七政推步) 中有西域歲前積年，至洪武甲子歲積若干算之語. 甲子爲洪武十七年. 其時書已譯行. 則琳之說非也.

(4) 西域阿剌必年，開皇己未爲元. 至洪武甲子，積七百八十六算.

beginning of the era mentioned by the *T'ui-pu* 推步, as a passage under the *Hui-hui-li-fa* of the *Ming-shih* says:—

"The origin of the calendar is the year of *chi-wei* of *K'ai-huang* which is the year in which the state was founded."(1)

And another passage says:

"The era began with the year of 'Arabī 阿喇必 (or the year *chi-wei* of *K'ai-huang* of the Sui dynasty) and it was 786 years previous to the year of *chia-tzŭ* of *Hung-wu*."(2)

Such was an established idea in these days. Here is one of the most difficult questions in the history of Chinese Mohammedanism. As to the view that regards the year of *chi-wei i. e.* the 19th year of *K'ai-huang* (599 A. D.) as the first year of the Mohammedan era, it resulted from converting the Mohammedan calendar into the Chinese, taking the 17th year of *Hung-wu* (1384 A. D.), namely, 786 A. H. as the starting point; and it was in an early part of the Ming dynasty that the year 785 years before the 17th year of *Hung-wu* was adopted as the first year of the Mohammedan era. All this has been definitely proved by the late Dr. KUWABARA in his "Sōken Seishinji Hi 創建清眞寺碑."(3) Now, on what basis was the Mohammedan calendar converted into the Chinese with the 17th year of *Hung-wu* as the starting point? In the 9th month, the 15th year of *Hung-wu* the Emperor issued the Imperial order for translating the *Hui-hui-li-shu*, etc., and as it is evident from the previously cited preface by WU Pai-tsung to the translation of the *T'ien-wên-shu*, and most probably in the 5th month, the following year, the translation of the *T'ien-wên-shu* was completed; but as to the date at which the *Li-shu* itself was completed, nothing is known. The present writer is convinced that the compilation of the translation of the *Hui-hui-li-shu* for which no record is produced in evidence, may be dated at the 17th year of *Hung-wu* which was adopted as the starting point of the convertion of the Mohammedan calendar into the Chinese. It may be said that because of the completion of this translation, such convertion became possible and necessary. In view of the fact that on the day of *ping-hsü* (12th) of the 10th month (intercalary) of this year, YÜAN T'ung 元統, Lou-k'o-po-shih 漏刻博士 (Doctor of horology) in the Astronomical Department sent in a petition to the Throne concerning the readjustment of the date of application of the Ta-t'ung 大統 calendar, and it was granted by the Emperor as recorded under the same date in the *T'ai-tsu-shih-lu* 太祖實錄 (Vol. 167), it may be considered that along with the decision of the date of application of the Ta-t'ung calendar, the date of application of the Hui-hui calendar was also decided upon. The conventional view that the Hui-hui calendar was directly converted into the Chinese calendar could hardly be supported. This, however, will be discussed later.

(1) 其曆元, 用隋開皇己未. 卽其建國之年也.
(2) 積年, 起西域阿喇必年 (隋開皇己未), 下至洪武甲子七百八十六年.
(3) *Tōyō-bummei-shi Ronsō* 東洋文明史論叢, *op. cit.*, p. 462.

The postscript by Pei-lin contains the phrase *Ching-wei-tu* 經緯度. But a book on this subject had already existed in China prior to the 18th year of *Hung-wu* in which the foreign calendar the postscript mentions was introduced into China. This may be proved by a passage under the *Hui-hui-li-fa* of the *Ming-shih* which says:—

"Emperor T'ai-tsu said, 'The method of computing heavenly phenomena practised in the Western Regions is more accurate than any other. The latitudes of the five planets it adopts are unknown to China;'"

And the preface on translating the *T'ien-wên-shu* by Wu Pai-tsung quoting the Emperor T'ai-tsu says."—

"Especially their method of latitudes is not yet discussed in Chinese books"(1)

It is evident that the T'ai-tsu knew of this method before the Imperial order issued in the 15th year of *Hung-wu;* and the fact that the Emperor had a book on it may be seen from a passage already quoted from the *Hsiu-ming-li-fa* 修明曆法 in the *Ming-shih-chi-shih-pên-mo* which reads:

"In the 15th year of *Hung-wu*, the Emperor ordered Wu Pai-tsung 吳伯宗 and others to translate the Hui-hui calendar, and various books on longitudes and latitudes and astronomy."(2)

When viewed in this light, Pei-lin's postscript, it seems, could not be trusted. A word may be added here. The mere fact that this method of longitudes and latitudes had not originated in China should not preclude the *Ching-wei-li-shu* 經緯曆書 in 8 vols. by an anonymous compiler recorded under the *Li-shu-lei* 曆數類 in the *I-wên-chih* of the *Ming-shih* (Bk. 98) as a Mohammedan book. Considering from the chronological order, the writer would rather ascribe it to Christianity.

As previously stated, the *Ssŭ-k'u-ch'üan-shu-t'i-yao* regards the *Ch'i-chêng-t'ui-pu* as identical with the *Hui-hui-li-fa* by Ma Shaikh reprinted in the *Kuo-shih-ching-chi-chih* by Chiao Hung 焦竑. As for the book by Chiao Hung called *Kuo-shih-ching-chi-chih*, according to Chiao Hung Chuan 焦竑傳 (Biography of Chiao Hung) in the *Wên-yüan* 文苑〔四〕 of the *Ming-shih* (Bk. 288), 竑 who was compiler 修撰 of the Academy, versed in the statutes of the Ming dynasty was in the 22nd year of *Wan-li* 萬曆 (1594 A. D.) requested to compile a history of the dynasty on the recommendation of Ch'ên Yü-pi 陳于陛, the Ta-hsüeh-shih 大學士, but 竑 humbly declined the request. He compiled only *Ching-chi-chih* 經籍志 (Remarks of bibliography), but undertook no other. The account in the *I-wên-chih* was surely based upon this *Ching-chi-chih;* therefore, the passage 馬沙亦黑 回回曆法三卷 in the *Ming-shih* was no doubt based on the account by Chiao Hung. Indeed, there occurs a phrase under Chêng-li 正曆 of *Li-shu* 曆數 of this *Ching-chi-chih* (Bk. 4, Pt. 2) reading 回回歷法三卷馬沙亦黑:

(1) 太祖謂，西域推測天象最精，其五星緯度，又中國所無.
(2) 其緯度之法，又中國書之所未備.
(3) (洪武) 十五年，命大學士吳伯宗等，譯回回曆・經緯度・天文諸書.

"*Hui-hui-li-fa* in 3 vols. by MA Shaikh." Considering that the *T'i-yao* 提要 identifies the *Ch'i-chêng-t'ui-pu* with the *Hui-hui-li-fa* by MA Shaikh recorded in the *Kuo-shih-ching-chi-chih* by CHIAO Hung, the *Hui-hui-li-fa* in 3 vols. recorded in the *Ming-shih* should necessarily be regarded as the *Ch'i-chêng-t'ui-pu*. However, the *Ch'i-chêng-t'ui-pu* is not in 3 vols. but in 7 vols., and when it was revised by Pei-lin, it was naturally enlarged or diminished. So it may be said that the *Hui-hui-li-fa* by MA Shaikh originally in 3 vols. was to be absorbed into the *Ch'i-chêng-t'ui-pu* in 7 vols. and has come down to this day in that form. This book included in the *Ssŭ-k'u-ch'üan-shu* is included neither in the *I-wên-chih* of the *Ming-shih* nor in the *Kuo-shih-ching-chi-chih*. Under the *Li-shu-lei* of the two works in question is mentioned the *Ch'i-chêng-ch'üan-shu* 七政全書 by an anonymous compiler, but this question may be let alone, because it has no relation whatever with the *Ch'i-chêng-t,ui-pu*. Further, the number of volumes of the *Hui-hui-li-fa* in the *Ming-shih* (Vols. 37–39), agrees with that by MA Shaikh; but according to the argument of the compiler of the *Li-chih*, it may be seen that it was by no means based on the work by MA Shaikh alone, though it may have been a valuable material in compiling the book.

From the foregoing investigation, the writer hopes that he has roughly made clear that the *T'ien-wên-ching* recorded in the *Ch'ing-chên-shih-i-pu-chi* is not the *Hui-hui-li-shu*, but the *Ming-i-t'ien-wên-shu*; and it may be appropriate to discuss here the general outline of the contents of the *Ming-i-t'ien-wên-shu*.

The reader will recall the following passage in the preface of the *T'ien-wên-ching*, or more strictly the *T'ien-wên-shu* attributed to MA Shaikh in the *Ch'ing-chên-shih-i-pu-chi*, which reads:—

"As a sagacious intellectual man is born, he understands and apprehends the mystery and establishes his theory. As wise men of later times closely succeed one after another, they receive the knowledge handed down from ancient sages, and leave it to posterity. Muhammad 馬哈麻 the sage and later sages came in succession. Their services in this great learning should be regarded as brilliant. The great sage *Ya-êrh* with vast knowledge and intelligence appeared, and investigated the most profound theories, and compiled the present book." (Quoted from the *Ming-i-t'ien-wên-shu*)(1)

According to this, it would seem that the book was written in Arabia and in accordance with Islam ideas. The preface by WU Pai-tsung which says 是書遠出夷裔: "This book comes from the descendant of a remote savege" is changed in the *Ch'ing-chên-shih-i-pu-chi* to 是書遠自天方聖裔: "This book comes from the sacred discendant of Arabia;" this is by no means a groundless alteration, if the foregoing preface is to be trusted.

Who is *K'uo-shih-ya-êrh-ta-hisen-chê* 闊識牙耳大賢者 mentioned as the direct compiler of this book in the preface of the *T'ien-wên-shu*? 闊識 and 大賢者

(1) 必有聰明睿智聖人者出，心得神會斯道之妙，立敎於當世. 後之賢人，接踵相承，又得上古聖人所傳之妙，以垂敎於來世也. 聖人馬哈麻，及後賢輩出，有功於大道者，昭然可考. 逮闊識牙耳大賢者生，闡揚至理，作爲此書.

are no doubt honorific terms; so 牙耳 alone must be his real name. The present-day pronunciation of 牙耳 being *ya-êrh*, it was probably pronounced somewhat like that. This may be seen from the fact that *ya* 呀 with the same pronunciation as 牙 is used, in the Toyo Bunko copy, as in *tê-êrh-ya* 得兒呀 for *daryā*=hai 海 (sea) *pi-ya-pa-hêi* 呀比巴黑 (黑 perhaps should read ên 恩) for *biyābān*=yeh 野 (field), and with *ya* 丫 with the same pronunciation as this letter is used in the Awa Library copy in *p'i-ya-tzŭ* 痞丫子 suggesting the original sound *piyāz*=ts'ung 葱 (onion) and *ya-mi* 丫密 for *yām* (kuan-i 館驛 post-house); from these examples of 呀 and 丫, 牙 was no doubt used in transcribing *yā* also. As for 耳, the letter 兒 with the same pronunciation as that indicates, when placed at the end of a transcribed word, the consonant sound *r* almost without exception; if viewed in this light, it is most appropriate to read it as *r*. Then *Ya-êrh* 牙耳 most certainly stands for the Persian *yār*.

What does *yār* mean? According to STEINGASS, it means 'friend, lover, comrade, companion, helper, defender,' while *yāri jān* means 'intimate friend,' and *yār shudan* 'to strike up friendship.' 呀兒 for *yār*=p'êng 朋 (friend) in the Toyo Bunko copy and 丫兒 for yu 友 (friend) in the Awa Library copy suggest the same word. It is no doubt that it has the original pronunciation as above-mentioned, but did any prominent person so named exist? Because the preface of the *T'ien-wên-shu* pays homage to him with such terms as 闊識 and 大賢者, he surely was a great character prominent in the history of Islam. The present writer would suppose him to be Abū Bakr, the first Khalīfa.

Abū Bakr needs no introduction in the history of Islam. He is well-known as one of the first converts to Islam, the Prophet's most trusted friend, father of 'Āisha, the Prophet's dearest wife, and his most faithful follower. As the Prophet was persecuted by his own Quraish tribe and decided to emigrate in 622 A.D., from Mecca his native place to Yathrib, or Medina of later days, Abū Bakr, fifty years old, was the only person that accompanied him. While he concealed himself for three days and nights in a cave on Mt. Ṣawr (Thawr) three miles southwest of Mecca, it was Abū Bakr who guarded against his pursuers and barely succeeded in making him escape from them literally by a miracle.(1) On account of this incident, *yāri ghār* originally "a companion in a cave" in the Persian language, came to mean 'an intimate friend, a reliable person, an acquaintance, and also another name of Abū Bakr himself.'(2) 牙耳, namely *yār*, the name of the person mentioned in the preface of the *T'ien-wên-shu*, may be regarded as a shortened form of *yāri-ghār*. If not accompanied by such honorific terms as 大賢者 and 闊識, this interpretation may involve some uncertainty, but in the presence of these phrases this interpretation would seem the most appropriate in this case. Ta-hsien 大賢 (great sage) in Moslem literature in China would usually refer to the four orthodox Caliphs, probably because of the convention to regard Muḥammad as Shêng-jên 聖人 (the sage)

(1) Emile DERMENGHEM, *The life of Mahomet*. in Eng., p. 4, pp. 146 ff.
(2) STEINGASS, *op. cit.*, p. 1525.

or Chih-shêng-chê 至聖者 (the greatest sage).

However, from a study of the contents, the *Ming-i-t'ien-wên-shu* could not at once be asserted as a product of Islamic ideas, nor could Abū Bakr be inferred as its original compiler. Even if the work was an Islamic product, Abū Bakr's authorship could never be established in the light of his career. Whether it was MA Shaikh the translator who prefixed *yār* (*yāri-ghār*) or Abū Bakr's name to the title of this book, or such a title was already used in those days, it cannot be settled readily. Still it was MA Shaikh or Shaikh Muḥammad who had the title of *Hui-hui-t'ai-shih* 回回太師 (Shaikh al-Islām *i. e.* Mohammedan Prelate) that in the preface conveyed a strong Islamic colour to this book.

The date of the compilation of the original of the *Ming-i-t'ien-wên-shu* is unknown. Though of a post-Islamic date, a glance at its contents would at once prove that the work is by no means an original product of Islam culture. Only the items be cited below. The book is in 3 vols., but is classified into 4 groups and 58 branches as follows:

Group I: 23 branches, all told. General matters and titles

Branch 1. Discusses the reason why this book is compiled as the first of the kind

Branch 2. Discusses the functions of the 7 *yao* 曜 (the sun, the moon, and the five planets)

Branch 3. Discusses the fortune and misfortune of the 7 *yao*

Branch 4. Discusses the *yin-yang* relations pertaining to the 7 *yao*

Branch 5. Discusses day and night pertaining to the 7 *yao*

Branch 6. Discusses the functions of each star at various distances from the sun

Branch 7. Discusses the 5 stars rising in the east and setting in the west

Branch 8. Discusses the functions of the fixed stars

Branch 9. Discusses the 12 zodiacal constellations divided into 3 classes

Branch 10. Discusses the *yin-yang* and day and night relations of the 12 zodiacal constellations

Branch 11. Discusses the functions of the 12 zodiacal constellations

Branch 12. Discusses the correlations of the degrees of the 12 zodiacal constellations

Branch 13. Discusses the zodiacal constellations to which the 7 *yao* belong

Branch 14. Discusses the degrees of the zodiacal constellations at which the 7 *yao* are powerful or powerless

Branch 15. Discusses the principal stars of the zodiacal constellations

Branch 16. Discusses the 5 stars belonging to each part of degrees of each zodiacal constellation

Branch 17. Discusses each zodiacal constellation divided into 3 parts

Branch 18. Discusses the position of each star
Branch 19. Discusses the correlations of the 7 *yao*
Branch 20. Discusses the energy of each star
Branch 21. Discusses the agencies of the *Ming-kung* 命宮 (the constellation fixing one's fortune), etc.
Branch 22. Discusses the sections on *Fu-tê* 福德 (fortune and virtue), etc.
Branch 23. Discusses the increasing energy of the chief star of each zodiacal constellation

Group II: 12 branches, all told. Interprets the fortune and misfortune of social affairs

Branch 1. Discusses general matters and titles
Branch 2. Discusses the probability of success in examinations
Branch 3. Discusses disaster and war
Branch 4. Discusses natural calamities and diseases
Branch 5. Discusses seasons, the heat and cold, wind and rain
Branch 6. Discusses rain and humidity
Branch 7. Discusses unusual phenomena of heaven and earth
Branch 8. Discusses and interprets celestial happenings
Branch 9. Discusses the rise and fall of prices
Branch 10. Discusses the eclipses of the sun and the moon
Branch 11. Discusses the uniting of Saturn and Jupiter at the same degree
Branch 12. Discusses the fortune of the world

Group III: 20 branches, all told. Discusses the fortune and life of man

Branch 1. Discusses general matters and titles
Branch 2. Discusses matters relative to the period before conception and birth
Branch 3. Discusses the details of degrees of *An-ming-kung* 安命宮
Branch 4. Discusses the control of the chidhood of man by the stars
Branch 5. Discusses the mutual agreement of human temperaments
Branch 6. Discusses the length of the life of each man
Branch 7. Discusses the evidence of diseases within and without the human body
Branch 8. Discusses the human nature and knowledge
Branch 9. Discusses the human diseases by the inharmony of the 7 *yao*
Branch 10. Discusses parents
Branch 11. Discusses brothers and sisters
Branch 12. Discusses wealth and happiness
Branch 13. Discusses making a living
Branch 14. Discusses marriage

Branch 15. Discusses man and woman
Branch 16. Discusses friend and enemy
Branch 17. Discusses removals, changes
Branch 18. Discusses the causality of human death
Branch 19. Discusses the number of years of human life which each star controls
Branch 20. Discusses *Liu-nien* 流年 and *Hsiao-hsien* 小限

Group IV: 3 branches, all told. Discusses selection in every line
Branch 1. General discussion on selection
Branch 2. Minutely classifies the conditions of selection
Branch 3. General conclusion on the reason for recommending this book(1)

A survey of titles under the foregoing groups and branches will clearly show the nature of this book. It is not mere physical astronomy, not a book for discovering the movement of the heavenly bodies through measurement and calculation by the use of the celestial globe and the astrolabe, but a book of astrology which avails itself of all the results of physical, mathematic experiments, applying the laws of the heavenly bodies to all human affairs. Under Branch 1 of Group I says:—

"If there is an essential principle in this book, it has been explained in full. There are two classes of explanation. As for the first class of explanation, it is necessary to find out the movement of the heavenly bodies, using the celestial globe and the instrument for measuring stars, and to

(1) 第一類 凡二十三門 總說題目
第一門 說撰此書爲始之由. 第二門 說七曜性情. 第三門 說七曜吉凶. 第四門 說七曜所屬陰陽. 第五門 說七曜所屬晝夜. 第六門 說各星離太陽遠近性情. 第七門 說五星東出西入. 第八門 說雜星性情. 第九門 說十二宮分分爲三等. 第十門 說十二宮分陰陽晝夜. 第十一門 說十二宮分性情. 第十二門 說十二宮分度數相照. 第十三門 說七曜所屬宮分. 第十四門 說七曜廟旺宮分度數. 第十五門 說三合宮分主星. 第十六門 說每宮分度數分屬五星. 第十七門 說每宮分爲三分. 第十八門 說各星宮度位分. 第十九門 說七曜相照. 第二十門說各星力氣. 第二十一門 說命宮等十二位分. 第二十二門 說福德等箭. 第二十三門 說各宮度主星强旺.

第二類 凡十二門 斷說世事吉凶
第一門 總論題目. 第二門 論上下等第應驗. 第三門 說災禍征戰之事. 第四門 說天災疾病. 第五門 說天時寒熱風雨. 第六門 說陰雨濕潤. 第七門 說天地顯象之事. 第八門 斷說天象. 第九門 說物價貴賤. 第十門 說日月交食. 第十一門 說土木二星同度相纏. 第十二門 說世運.

第三類 凡二十門 說人命運幷流年
第一門 總論題目. 第二門 說人生受胎未生之前事. 第三門 說安命宮度備細. 第四門 說人生幼時皆星辰照管. 第五門 說人生相稟氣. 第六門 說人壽數短長. 第七門 說人內外病證. 第八門 說人生性智識. 第九門 證人風證病患. 第十門 論人父母. 第十一門 論兄弟姊妹. 第十二門 說財帛福祿. 第十三門 說人生何藝立身. 第十四門 說婚姻. 第十五門 說男女. 第十六門 說朋友幷僕人. 第十七門 說遷移. 第十八門 說人壽終緣故. 第十九門 說人生每一星主幾年. 第二十門 說流年幷小限.

第四類 凡三門 說一切選擇
第一門 總論選擇. 第二門 細分選擇條件. 第三門 總結推用此書之理.

investigate the principle mathematically and in full. For this reason, two books have already been compiled; so if a man masters this book he will acknowledge it as the very highest and noblest writing. As for the second class of explanation, the heavenly bodies and the seven *yao* indicate luck or ill-luck in accordance with the luck or ill-luck of the world. This luck or ill-luck is determined only by the use of the celestial globe and mathematics above-mentioned and by experimenting it in person. However, unless it be a definite principle, sometimes it may not be experimented. Simply because it is not experimented, this book should not be discarded at once. That the nature of the sun is hot, and dry, and that of the moon is damp and wet, and that seasons are not alike; that the cold and the heat are varied; that there is much rain sometimes and at other times little rain; these are because of that various stars meet with the sun, or the sun meets with various stars and is in the range of certain zodiacal constellations, or various stars meet themselves. All are due to this reason — these are manifest principles handed down from ancient times to this day. If a person is well-versed in the vicissitudes of the function of various stars and the degrees at which they meet themselves, he will be able to tell the cold or heat, a drought or a flood, and the epidemics of the year; he will also know success or failure, the good or ill-fortune of human affairs. If really versed in it, he will be able to prepare for every thing beforehand."(1)

And in concluding Branch 3 under Group IV, it says:

"The theories of all astronomical phenomena, the *yin-yang* relations, good fortune and ill-fortune have been explained. Nothing has been left untouched. Success or failure in any case may be all divined by consulting this book. In foretelling the fate of all human affairs, a careful observation of the vicissitudes of stars should be made in detail. Even if he detects a star indicating good fortune, he should not at once declare a prosperous future. Even if he meets with a star indicating ill-fate, he should not at once decide for the ill-fate. Only after the sign of the star is supported by another of the kind, the future should be foretold."(2)

And a study of these quotations will the more definitely elucidate the purport of the compiler of this book.

The general features of the *Ming-i-t'ien-wên-shu* have been presented in

(1) 凡書中緊要之理，則備言之．其說有兩等．第一等說，要知天輪行度之法，必用渾儀幷測星之物，以算法推詳其理．爲此，已撰二書在前．若人於此書精通，則知此爲至高至貴之文．第二等說，天輪七曜，有吉有凶，應世上之吉凶．其吉凶云何．必用上文所言渾儀·算法，體驗而後知之．然非一定之理，間有不驗之時．不可因其不驗，遂廢此書也．如太陽性熱且燥，太陰性濕潤，又如四時不等，寒暑不同，或雨多，或雨少，因各星與太陽相遇，或太陽與各星相遇，在何宮分，或各星自相遇，以此故也．此是顯然之理，自古相傳至今．若人參透各星性情衰旺，及相遇度數，則知四時寒暑·旱澇·疾疫，又知人事禍福吉凶．既能先知，凡事可以豫備．

(2) 凡論天文形象·陰陽吉凶之理，備載於前，至矣盡矣．所應禍福，依此書逐一推斷可也，若一切斷決人事吉凶，看星象强弱衰旺，宜子細詳之．凡遇一吉星，不可便作吉斷．遇一凶星，不可便作凶斷．須看再有吉凶相助，然後斷其吉凶．

the foregoing. This translated book, if imagined from its title, would seem to belong to the category of astronomy. A closer study of its details, however, would prove the book to belong to the category of astrology. Moreover, in spite of its preface attributed to "K'uo-shih 闊識 *yār* ta-hsien-chê 大賢者"— namely, Abū Bakr in the writer's opinion, this book is found to contain nothing peculiar to Islamism though it cannot be denied that the bulk of the book is made up of astrological principles which originated in ancient Babylon and spread in all directions. It goes without saying that the position which Babylonian astrology occupies in the history of astronomy is overwhelmingly conspicuous. The main current of this branch of learning originated in this country was introduced into Greece in the 4th century B. C., where it was developed to higher degree, and was rushed east to influence India and China; and it branched off to Rome in the west, and to Egypt in the south. It pervaded the age and the world of Hellenism, overflooded the Islam world from the 7th to the 13th century, and it is not too much to say that its influence is still felt throughout the world. The compilation of the original of the *Ming-i-t'ien-wên-shu* cannot be dated yet; perhaps it is not necessary to go back beyond the origin of Islamism. Even though a work of an Islam age, it is regrettable that no contents characteristic of Islamic creed could be found in it. Only a few points suggestive of Ṣūfī thought might be detected in the argumentation of this book. Though an extremely important matter, the present writer wishes merely to mention the question in this connection. For this form of argumentation must be closely analysed before one can definitely decide whether the thought is genuinely of Ṣūfī or of something which existed before it. On the other hand, whether the original was in Arabic or Persian it cannot be determined readily because the original is so elaborately translated that the text contains not a word of the original. However, in view of the word 牙耳 in the phrase 闊識牙耳大賢者 which occurs in the preface, and could only be explained by the Persian word *yār*, which is not found in the Arabic language, and if this word could mean what has previously been suggested, it would be only more appropriate to say that the translators are not responsible for attributing the book to this great sage, but that they base their argument on the statement in the original; so it would be difficult to assert that at least the original book which Ma Shaikh and others translated was not a Persian work. And the bulk of the contents of this book consists, as shown under the branches of Group I, in *Ch'i-yao* 七曜 (the sun, the moon, and the five planets) and *Shih-êrh-kung* 十二宮 (the 12 zodiacal constellations). When viewed in this light, it is beyond doubt that this one had much in common with the so-called *Hui-hui-li-fa* also based on *Ch'i-yao* and the 12 zodiacal constellations; indeed, the two represented the two sides of one and the same thing.

Now, the compilers of the *Ming-shih* devote 3 vols. (Vols. 37–39) in describing the *Hui-hui-li-fa;* so a careful study of the subject will ensure a thorough comprehension of its general features. And as the *Ch'i-chêng-t'ui-pu*

by Pei-lin may be known to-day, it may be possible and necessary to make a comparative investigation of the contents of the two works; only the writer has not yet completed his preparations for developing his investigation in this line at the present moment. Briefly speaking, however, the *Hui-hui-li-fa* of the *Ming-shih* and the *Ch'i-chêng-t'ui-pu* are based on the same principle, though one is more elaborate and detailed in description than the other; they seldom disagree on the same subject. It is advisable, however, to make use of the *Ch'i-chêng-t'ui-pu* because its compilation is better and therefore more readable, its description is often more detailed and contains some items not adopted in the other. The opening passage under the *Hui-hui-li-fa* of the *Ming-shih* reads:

"The *Hui-hui-li-fa* has been made by 國王馬哈麻 (King Muḥammad of Mo-ti-na 默狄納 (Madīna, Madīnah, Madīnat an-Nabī'=Medina) of the Western Regions...(omitted)...the first year of this calendar corresponds to the year *chi-wei* 己未 of *K'ai-huang* of the Sui dynasty. For it was the year in which their state was founded."(1)

And another passage says "The era began with the year of *A-la-pi* 阿喇必 ('Arabī) (or of the *chi-wei* of *K'ai-huang* of the Sui dynasty) and it was 786 years previous to the year *chia-tzŭ* of *Hung-wu*." As to why the year of *chi-wei* or the 19th year of *K'ai-huang* (599 A. D.) was adopted as the first year of the calendar and why the years were calculated until the year of *chia-tzŭ* or the 17th year of *Hung-wu* (622 A. D.), it has already been referred to; so it may not be necessary to discuss it again. According to the *Ch'i-chêng-t'ui-pu* which adopts the same era, this calendar is found to be based upon the Hegira (al-Hijra) which is commonly known to correspond to 622 A. D., but to which the *Hui-hui-li-fa* erroneously ascribes the year of *chi-wei* of *K'ai-huang* (599 A. D.) If so, it would be perfectly right, as the *Li-chih* of the *Ming-shih* does, to identify this calendar with the so-called Mohammedan calendar which is a genuine lunar calendar established by the founder of Islamism. Only the claim that the so-called Mohammedan calendar was established by Muḥammad, the founder of the religion, is nothing but a legend on the part of the Mohammedans.

However, this kind of hasty conclusion should not be accepted, because as Mei Wên-ting 梅文鼎, the great authority on calendars, in discussing the *Ch'i-chêng-t'ui-pu* by Pei-lin comments on it in his *Wu-an-li-suan-shu-chi* 勿菴曆算書記 as follows:—

"The Hui-hui calendar was published by Pei-lin. In distributing the principal positions, the lunar calendar is used, and in calculating distances, the solar calendar is used. It delicately contains fundamental rules. Even their descendants belonging to the astronomical department do not understand it very well."(2)

The characteristic of this book consists in the parallel adoption of the lunar

(1) 回回曆法，西域默狄納國王馬哈麻所作. (中略) 其曆元用隋開皇己未. 卽其建國之年也.

(2) 回回曆，刻于貝琳. 其布立成，以太陰年，而取距算，以太陽年. 巧藏根數. 雖其子孫隸臺官府者，弗能知.

and solar calendars. It goes without saying that the *Hui-hui-li-fa* included in the *Ming-shih* was of a similar nature. What indicates the solar calendar is the 12 zodiacal constellations beginning with Pai-yang-hsü-kung 白羊戌宮 (Aries); and they are called Pu-tung-ti-yüeh 不動的月 (immovable months), and the ordinary year has 365 days; for a leap year, one day is added to 30 days under Shuang-yü-hai-kung 雙魚亥宮 (Pisces) to make the year 366 days. The lunar year is made up of Tung-ti-yüeh 動的月 (movable months); an odd-number month (Tan-yüeh 單月 in the *Ming-shih*) is a long one containing 30 days, and an even-number month (Shuang-yüeh 雙月 in the *Ming-shih*) a short one containing 29 days. The year is composed of 12 months (6 long months and 6 short months), making one ordinary year of 354 days and a leap year of 355 days. Judging from the passage(1) of the *Ch'i-chêng-t'ui-pu*, the lunar year composed of the so-called "movable months" should be included in the genuine lunar calendar. If so, should this be taken as the twelve months of the genuine Mohammedan calendar?

What is interesting in this account in the *Ch'i-chêng-t'ui-pu* is the following names of the twelve months. However, as the name of months are unfortunately lacking in the *Hui-hui-li-fa* of the *Ming-shih*, it is impossible to know the exact facts; probably the names of months as in the case of the *Ch'i-chêng-t'ui-pu*, have been omitted for convenience' sake. Under the same heading in the *Ming-shih*, the passage reads Yüeh-fên-ta-hsiao Tan-yüeh-ta Shuang-yüeh-hsiao 月分大小, 單月大雙月小: "Months are either long or short. Odd-number months are long; and even-number months short." And then occurs about the same explanation as found in the postscript of the *Ch'i-chêng-t'ui-pu*. The *Ch'i-chêng-t'ui-pu* (Vol. 1) contains the following account.

"Explanations on long and short months and on the pronunciation of their original names

1st month, long: named *Fa-êrh-wo-êrh-ting* 法而斡而丁
2nd month, short: named *A-êrh-ti-pi-hsi-shih* 阿而的必喜世
3rd month, long: named *Hu-êrh-ta* 虎而達
4th month, short: named *T'i-êrh* 提而
5th month, long: named *Mu-êrh-ta* 木而達
6th month, short: named *Sha-ha-lieh-wo-êrh* 沙合列斡而
7th month, long: named *Lieh-hêi-êrh* 列黑而
8th month, short: named *A-pan* 阿班
9th month, long: named *A-tsa-êrh* 阿咱而
10th month, short: named *Ta-i* 答亦
11th month, long: named *Pa-ha-man* 八哈慢
12th month, short: named *I-ssŭ-fan-ta-êrh-ma-ti* 亦思番達而麻的

(1) *cf.* p. 149, Note (1) 已上十二月，即回回曆書所謂動的月者是也. 大月三十日，小月二十九日，共三百五十四日，乃十二月之日也，若遇月分有閏之年，第十二月內，又添一日爲大月，其十二月得三百五十五日也.

The above-mentioned 12 months are those called movable months by the *Hui-hui-li-shu*. A long month contains 30 days, and a short one 29; 354 is the number of days in 12 months. If the months happen to be in a leap year, a day is added to the 12th month to make the month a long one. The 12 months thus contain 355 days."(1)

When viewed in light of the explanation in this postscript of the *Ch'i-chêng-t'ui-pu*, this system is evidently that of the genuine lunar calendar, namely the Mohammedan calendar and not a calendar, which might be termed a lunar-solar calendar which provides not intercalary days, but intercalary months, to reconcile it with the solar years. The Mohammedan calendar is a genuine lunar calendar which adopts as the first day of the first year of the new era, July 16th, 622 A. D., the year which the Prophet Muḥammad fled from Mecca to Medina. An odd-number month containing 30 days and an even-number month contatining 29 days are arranged alternately; an ordinary year has 354 days: for a leap year, an extra day is added to the last month to make it a year of 355 days. As for a leap year, 30 lunar or Mohammedan years make up a period; to each period 11 leap years are distributed, — the 2nd, 5th, 7th, 10th, 13th, 16th, 18th, 21th, 24th, 26th, and 29th of each period being leap years. The *Hui-hui-li-fa* of the *Ming-shih* is fairly accurately reporting when it says: "In 354 days a circuit is made. In the 12th month of the circuit, occurs an intercalary. There occur 11 intercalary days in each 30 years."(2) The average number of days in a lunar year is 354 11/30, while that in the solar year is slightly over 365.24, the ratio being 1 : 0.970224. Therefore, 32 years of the ordinary solar calendar corresponds to approximately 33 years of the Mohammedan calendar; and if a certain month, in the Mohammedan calendar, is a summer month this year in the solar year, the same month will be a winter month in the solar calendar 16 years hence.

The division of months into long and short months recorded in the *Ch'i-chêng-t'ui-pu* is based upon the genuine lunar calendar; the distribution of days is like that of the Muhammedan calendar; and the beginning of the era is placed at the year of the Prophet's flight (Hijrat, Hijra) to Medina, namely the first year of the Mohammedan calendar. Judging from these facts, the calendar of the *Ch'i-chêng-t'ui-pu* may be said to be the Mohammedan calendar. Only this book makes a blunder here, as previously stated, when it ascribes to the date the years of *chi-wei* (the 19th year) of *K'ai-huang* 開皇 of the Sui dynasty.

(1) 釋月分大小及本音名號

第一月大	名法而斡而丁	第二月小	名阿而的必喜世
第三月大	名虎而達	第四月小	名提而
第五月大	名木而達	第六月小	名沙合列斡而
第七月大	名列黑而	第八月小	名阿斑
第九月大	名阿哨而	第十月小	名答亦
第十一月大	名八哈慢	第十二月小	名亦思番達而麻的

(2) 以三百五十四日爲一周. 周十二月, 有閏日. 凡三十年閏十一日.

Yet there is something which gives the reader a strange impression in the account of the *Ch'i-chêng-t'ui-pu*. It is the fact that despite the arrangement of months in accordance with the Mohammedan calendar, the transcriptions of the names of months found there are not Arabic names used in the Mohammedan calendar. As will be stated later, the lst month of the Mohammedan calendar being called Muḥarram in solemn Arabic, 法而斡而丁 the name of the lst month recorded in the *Ch'i-chêng-t'ui-pu* could not be a transcription of this word. What could this mean, then?

The appearance of the trancsription 法而斡而丁, without citing the instances of the transcription of each ideograph will at once remind the reader of the *farwardīn*, or January of the ancient Persian calendar. Not merely the name of the lst month, but those of the succeeding month perfectly coincide with the names of months in the ancient Persian calendar, and there is no indication of their agreeing with the Arabic names of the 12 months of the Mohammedan calendar. The names of the 12 months will be cited later; here the original terms recorded in the *Ch'i-chêng-t'ui-pu* and the original in the ancient Persian calendar will be compared.

	Names of months in the *Ch'i-chêng-t'ui-pu*	Names of months in the ancient Persian calendar
1st month	法而斡而丁	Farwardīn
2nd month	阿而的必喜世	Ardī bihisht
3rd month	虎而達	Khurdād
4th month	提而	Tīr
5th month	木而達	Murdād
6th month	沙合列斡而	Shahrīwar
7th month	列 (pieh 別?) 黑而	Mihr
8th month	阿琶	Ābān
9th month	阿咱而	Āzar
10th month	答亦	Dai
11th month	八哈慢	Bahman
12th month	亦思番達而麻的	Isfandārmuz̲

It would be needless to cite examples and investigate the accuracy or inaccuracy of each transcription. Only 列黑而 for the 7th month should probably read 別黑而, otherwise the initial sound of the Persian word could not be expressed. 別 (pieh) might do because *p* and *m* were interchangeably used from ancient times. Apart from this only correction, the transcriptions in the *Ch'i-chêng-t'ui-pu* will be found at a glance to represent the original words rather accurately.

A word may be said for reference on the ancient Persian calendar in quesition. This was a solar calendar, composed of 12 months, each with 30 days, and in an ordinary year 5 days added to the end of the 12th month; and in a leap year which occurs once every 4 years, an extra day besides the usual 5 days is added. And the chracteristic of this calendar belonging to the

Babylonian school of calendars is that the vernal equinox, namely about the 21st of March when the sun enters Aries is taken as the first day of the year. So its first month fell between the last part of March and the middle of April; and the 12th month (*isfandārmuz*) corresponded to the 2nd month and the 3rd month of the following year. With the diffusion of Mohammedanism, the Mohammedan calendar came to be adopted; and though it is said to have gradually passed beyond practical use, March 21st is even to-day one of the chief events of the year of Persia as the New Year festival (*'Īdi-nau-rūz*).

Thus the *Ch'i-chêng-t'ui-pu* with its "movable months" essentially adopts the genuine lunar year of the Mohammedan calendar, but the names of 12 months in the solar calendar of ancient Persia. And as pointed out in the above-mentioned comment by MEI Wên-ting 梅文鼎, the solar year is used in calculating distances. For this purpose the so-called "immovable months" formed by Aries and the 11 other zodiacal constellations were made use of. The system of the 12 zodiacal constellations as a point of departure chooses the vernal equinox when the sun enters Aries as may be evident from the order in which the 12 constellations are arranged, and also from the markings on the constellations under *Kung-fên* 宮分 (zo-diacal constellations) in the *Hui-hui-li-fa* of the *Ming-shih*, as Pai-yang-ch'u 白羊初 (Aries at the beginning); Chin-niu-i 金牛一 (Taurus 1); Yin-yang-êrh 陰陽二 (Gemini 2); down to Pao-p'ing-shih 寶瓶十 (Aquarius 10); Shuang-yü-shih-i 雙魚十一 (Pisces 11). Branch 9 under Group I of the *Ming-i-t'ien-wên-shu* previously quoted, in discussing the 12 zodiacal constellations divided into 3 classes, accurately explains the relations between the 12 constellations and the sun, the positions which the 12 constellations take on the zodiac, and the relations between the 12 constellations and the seasons as follows:

"As to the two constellations Aries and Libra, as the sun reaches them, day and night stop *i.e.* are equal. The constellations from Aries to Virgo are called the 6 northern constellations. Those from Libra to Pisces are called the 6 southern constellations. When the sun enters Aries, it turns north. When it enters Libra, it turns south. After reaching the first degree of Cancer the sun gradually turns south, and after reaching the first degree of Capricornus, the sun gradually turns north. These four constellations are all called turning constellations. The four constellations Taurus, Leo, Scorpio, Aquarius, — are called fixed constellations. The four constellations, — Gemini, Virgo, Sagittarius, Pisces — are called double-body constellations. Aries, Taurus, and Gemini belong to spring. Cancer, Leo, and Virgo belong to summer. Libra, Scorpio, and Sagittarius belong to autumn. Capricornus, Aquarius, and Pisces belong to winter."(1)

The phrase "divided into 3 classes" means that the 12 constellations are divided into Chuan-kung 轉宮 (turning constellations), Ting-kung 定宮 (fixed constellations) and Êrh-t'i-kung 二体宮 (double-dody constellations). And some other matters on the constellations are discussed in this book; but having no

direct relation with the present theme, they are omitted here. By means of this account in the *T'ien-wên-shu*, at any rate, the nature of the 12 zodiacal constellations may be inferred, and the common nature of the *Ming-i-t'ieng-wên-shu* and the *Hui-hui-li-fa* may be more precisely grasped. When viewed in this light, it is evident that the ancient Persian calendar with 12 months named *farwardīn* and so on, and the year with the 12 months including the so-called Pu-tung-ti-yüeh 不動的月 "immovable months" despite the varied numbers of days allotted for each month or constellation, they both adopted as the beginning of a new year the vernal equinox when the sun enters Aries. So it is beyond question that they were both based upon the solar calendar originated in Babylonia that adopted the vernal equinox as the beginning of a new year. The calendar which was diffused into the east after the eastern conquest by Alexander the Great may be of a similar system.

From the foregoing it has been shown that the so-called *Hui-hui-li-fa* was not a genuine lunar calendar of Mohammedanism, but one making use of the calendar of ancient Iran and its terms; more particulary, the names of its "movable months" were solely borrowed from the Persian solar calendar. The present writer is not at this time going to undertake the task of investigating the etymology of the above-mentioned month-names beginning with *farwardīn* and so on.

When argumentation has been carried to this point, a new view may be taken as to the reason why the Hui-hui callendar adopted, as its first year, the year of *chi-wei* (the 19th year) of *K'ai-huang* of the Sui dynasty. This error has always been accounted for as introduced in converting the Mohammedan era to the Chinese calendar originated from the 17th year of *Hung-wu*. Was it really the case? As stated above, the Hui-hui calendar in computing distances, based on the solar year or the "immovable months" of the 12 zodiacal constellations, while, in distributing the positions of the heavenly bodies, depended on the lunar year of the 12 "movable months." On the occasion of converting the calendars in the 17th year of *Hung-wu*, did the compilers not introduce the error when they converted the Mohammedan calendar of years consisting of "movable months" with years consisting of "immovable months"? It would seem more appropriate to suppose that the Mohammedan calendar and the Chinese were not immediately converted, but the year of "immovable months" formed the intermediate between the two calendars. As every one knows, the Chinese calendar is a lunar-solar calendar.

Now, we may turn to the names of the seven days of the week which are closely related to those of the 12 months. Under the *Hui-hui-li-fa* in the

(1) 白羊與天稱二宮，太陽到此，晝夜停. 自白羊宮至雙女宮，爲北六宮. 天稱宮至雙魚宮，爲南六宮. 入白羊宮，轉北. 入天稱宮，轉南. 太陽至巨蠏宮初度後，漸轉於南. 至磨羯宮初度(後)，漸轉於北. 此四宮，皆呼爲轉宮. 金牛宮，獅子宮，天蝎宮，寶瓶宮，此四宮，呼爲定宮. 陰陽宮，雙女宮，人馬宮，雙魚宮，此四宮，呼爲二體宮. 白羊宮，金牛宮，陰陽宮，屬春. 巨蠏宮，獅子宮，雙女宮，屬夏. 天稱宮，天蝎宮，人馬宮，屬秋. 磨羯宮，寶瓶宮，雙魚宮，屬冬.

Li-chih of the *Ming-shih*, a passage simply reads:—

"The number of the seven days of the week. Sunday 1; Monday 2; Tuesday 3; Wednesday 4; Thursdy 5; Friday 6; Saturday 7; seven days of the week used for designating days; the *chia-tzŭ* system *i.e.* the sexagenary cycle is not used."(1)

It only serves to show that this calendar used, not the sexagenary cycle, but thesev en days of the week. The *Ch'i-chêng-t'ui-pu* (Vol. 1), likewise gives the transcriptions of the names of the seven days of the week, which are given under *Shih-ch'i-yao-shu-chi-pên-yin-ming-hao* 釋七曜數及本音名號 "Explanation of the seven days of the week and their original terms."

Jih-i-shu	日一數	Yeh-shan-pieh	也閃別
Yüeh-êrh-shu	月二數	Tu-shan-pieh	都閃別
Huo-san-shu	火三數	Hsieh-shan-pieh	寫閃別
Shui-ssŭ-shu	水四數	Ch'a-êrh-shan-pieh	察兒閃別
Mu-wu-shu	木五數	P'an-shan-pieh	盤閃別
Chin-liu-shu	金六數	A-ti-na	阿的那
T'u-ch'i-shu	土七數	Shan-pieh	閃別

Judging from the manner of writing 日一數 (Sunday No. 1), the names of the seven days of the week in the *Li-chih* of the *Ming-shih* which should have been recorded in the same way if it had been. All the transcriptions except that of 金六數 阿的那 have 閃別 at the end, which must be the transcription of the Persian word *shambah*. This word means not only 'Saturday,' but also simply 'day'; *shambihī* means 'to have sabbath,'—a word connected with the Jewish custom of observing sabbath on Saturday; probably a word originated from a term in the Syrian calendar. Leaving out 閃別, the characters 也·都·寫·察兒·盤 used in the transcriptions must be Persian words, *yak* (one), *dū* (two), *sih* (three), *chahār* (four), and *panj* (five), respectively corresponding to the phrases from 日一數 (Sunday No. 1) to 木五數 (Thursday No. 5). Only *ch'a-êrh* 察兒 meaning 'four' should more properly be interpreted to represent, not the more ordinary word *chahār*, but rather *chār* another word with a similar meaning. The single ideograph *yeh* 也 for the original *yak* seems a somewhat careless rendering, but probably *k'o* 克, *ch'i* 起 or some such ideograph which followed 也 has been left out. The numerals *yak*, *dū*, *sih*, *chahār* (*chār*), *panj* are transcribed *yeh-k'o* 夜克·*tu* 都·*hsieh* 歇·*ch'a-ha-êrh* 叉哈兒·*fan-chih* 潘知 under *Shu-mu-mên* 數目門 in the Toyo Bunko copy, and *yeh-k'o* 葉克·*tu* 都·*shih* 歇·*ch'a-ha-êrh* 杜哈兒·*fan-chih* 潘只 under the same branch in the Awa Library copy. In these two books, the word *four* was evidently transcribed from the pronunciation *chahār*. 阿的那 or 金六數 (Friday, No 6) is no doubt the transcription of *ādīnah* the Persian for Friday; it has the nature of corres-

(1) 七曜數，日一·月二·火三·水四·木五·金六·土七. 以七曜紀日，不用甲子.

ponding to that of the present Saturday, but the etymology is still to be investigated. Thus the names of the seven days of the week recorded in the *Ch'i-chêng-t'u-pu* have been found to be all Persian words; none of them could be recognized as Arabic. The presence, in the *Hui-hui-li-fa*, of the Persian names for the seven days of the week, — *yak shaṃbah* (from middle Persian: *Eo-Shambat* — *Yao-sên-wên* 曜森文, *Yao-sên-wu* 曜森勿), *dū shaṃbah, sih shaṃbah, chahār shaṃbah*(*chār shaṃbah?*), *panjsh aṃbah, ādīnah, shaṃbah* — as well as that of the Persian names of the 12 months, would serve as valuable material in suggesting the general character of the *Hui-hui-li-fa*. It would be specially important to note the complete absence of the religious character of the Mohammedan calendar in the names of the seven days of the week as well as in the names of months. It is needless to point out the fact that the Arabic names of the week run from *yaum al-ahadi* (Sunday) to *yaum as-sabti* (Saturday).

The next question to consider must be how long the *Hui-hui-li-fa* retained this characteristic. It is regrettable that no concrete material to answer it is found at present. However, this characteristic was no doubt retained through the Ming dynasty and to the beginning of the Ch'ing dynasty, as is indirectly proved by the *Li-hsüeh-hui-t'ung* 曆學會通.

The *Li-hsüeh-hui-t'ung* in the possession of the Seika-dō Library is a compilation by Hsieh Fêng-tsu 薛鳳祚, with his own preface dated the year of *jên-yin* 壬寅 (the 1st year) of *K'ang-hsi* 康熙 (1662 A. D.) and is composed of the *T'ien-pu-chên-yüan* 天步眞源 in 14 vols. and the *Hsi-yü-hui-hui-li* 西域回回曆 in 2 vols. A passage (p. 21) in the summary and index of the *Wên-su-ko Ssŭ-k'u-ch'üan-shu* 文溯閣四庫全書要略及索引 revised in April, the 5th year of *K'ang-tê* 康德 says: —

"*T'ien-pu-chên-yüan* in 1 vol., translated by Hsieh Fêng-tsu of the Ch'ing dynasty. 1 bk., 26 leaves."(1)

And also "The *T'ien-hsüeh-hui-t'ung* in 1 vol., by Hsieh Fêng-tsu of of the Ch'ing dynasty, 1 bk., 22 leave."(2) Theses must be different writings. Especially as for the *T'ien-pu-chên-yüan*, though of a similar title, one is in 1 vol., while the other is in 14 vols.; so the difference in the contents may be imagined. The names of months given in this book all coincide with those in the *Ch'i-chêng-t'ui-pu*. Only the ideograph 斡 (wo) in the transcriptions for the first and sixth months in the *Ch'i-chêng-t'ui-pu* is replaced by the ideograph 幹 (kan) which should be regarded as a careless mistake committed in copying. As for the names of the seven days of the week, they are given exactly alike. As this book is supposed to have been revised by Hsieh Fêng-tsu by referring to the Hui-hui-li of the official edition, it should be of the same nature as the *Ch'i-chêng-t'ui-pu* and the *Hui-hui-li-fa* of the *Ming-shih*. This point may be ascertained by the perusal of the book.

(1) 天步眞原一卷, 淸薛鳳祚譯, 一册二十六葉.
(3) 天學會通一卷, 淸薛鳳祚撰, 一册二十二葉.

So it seems that the *Hui-hui-li-fa* of the *Ch'i-chêng-t'ui-pu* style was practised in China during the first years of *K'ang-hsi* 康熙, but the custom was deserted in the course of time. It was forgotten even by those interested in the Mohammedan calendar. An instance may be cited here. Thre is a Mohammedan book entitled "*T'ien-fang-li-yüan* 天方曆源" (the date of 1st ed. not known) reprinted in the 9th month, the 1st year of *Kuang-hsü* 光緒 (1875 A. D.) towards the end of the Ch'ing dynasty — a work and translation on the Mohammedan calendar, 17 pages in Chinese and 14 pages in Arabic — translated by MA Yu-ling 馬佑齡, a Mohammedan of Jên-shan 仁山 of Yün-nan 雲南. The preface in Chinese ascribes the work to *Ch'a-êrh-fan-êrh* 喳爾凡爾, the ancient sage, but the authorship is doubtful, and the date of compilation is unkown. 喳爾凡爾 may be the transcription of *Ja'far*.

A glance at the names of the 12 months in this book will show the entire absence of the names adopted by the *Ch'i-chêng-t'ui-pu* and the *Li-hsüeh-hui-t'ung* and the presence of entirely new ones, *Mu-han-lan* 母哱蘭 and others which are no doubt the names of months in the Mohammedan calendar. Below will be listed the ideographs in the *T'ien-fang-li-yüan* and the corresponding original words.

Names of Months		Names in the *T'ien-fang-li-yüan*	Names in the Mohammedan calendar
January	Mu-han-lan	母哱蘭	Muḥarram
February	Shai-fei-êrh	色非爾	Ṣafar
March	(T'ou)-lê-pi-êrh	頭勒比爾	Rabī 'l-awwali
April	(Wei)-lê-pi-êrh	尾勒比爾	Rabī 'l-ākhiri
May	(T'ou)-chih-ma-êrh-tu	頭止媽爾睹	Jumādā 'l-ūlā
June	(Wei)-chih-ma-êrh-tu	尾止媽爾睹	Jumādā 'l-ākhirati
July	Lê-chê-pu	勒者補	Rajab
August	Shê-êrh-pa-ni	舍爾巴你	Sha'abān
September	Lê-mai-tsa-ni	勒買咱你	Ramaẓān
October	Shê-a-li	舍阿里	Shauwāl
November	Tsu-li-ko-êrh-tê	祖里革爾德	Ẕū 'l-qa'dati
December	Tsu-li-han-chê	祖里哱者	Ẕū 'l-ḥijjati

These names of 12 months, as already stated, are those exclusively employed by the Mohammedan calendar, and are naturally Arabic. Not until the publication of this book or the first years of *K'ang-hsi* of the Ch'ing dynasty, were introduced the full names of months adopted in the Mohammedan calendar. Now the *T'ien-fang-li-fa-chên-t'u-pên* 天方曆法眞圖本, a book published before this in the 1st year of *Hsien-fêng* 咸豐 of the Ch'ing dynasty (1851 A. D.), according to I. MASON[1] is based on an Arabic book; and the famous *T'ien-fang-chi-shêng-*

(1) I. MASON, "Notes on Chinese Mohammedan Literature," J. N. C.B.R.A.S., Vol. LVI, p. 203.

shih-lu-nien-p'u 天方至聖實錄年譜 by Liu Chih 劉智 alleged to have been completed in the 2nd year of *Yung-chêng* 雍正 of the Ch'ing dynasty (1724 A. D.) also uses the names of months of the Hui-hui calendar. In the book are recorded 正月 (January) 穆哈闢, 二月 (February) 色法爾, 三月 (March) 勒比而奧臥立, 四月 (April) 勒比爾阿后爾, 五月 (May) 哲馬獨臥立, 六月 (June) 哲馬獨阿后爾, 七月 (July) 勒哲卜, 八月 (August) 捨而邦, 九月 (September) 勒默減, 十月 (October) 少哇立, 十一月 (November) 祖立格爾德, 十二月 (December) 祖立后哲. Though the ideographs are different from those used in the *T'ien-fang-li-yüan*, the original words must surely have been identical.

In spite of the fact that the *T'ien-fang-li-yüan* was written in Arabic and gives the names of months adopted in the Mohammedan calendar, even this work contains some influence of the Persian language as may be detected in the transcriptions of the names of the last two months. The two names in Arabic should read respectively *z̲ū 'l-qa'dati, z̲ū 'l-ḥijjati*. Now, these transcriptions both lack the *t* sound at the end. This *t* sound which indicates the word-ending of a feminine noun in Arabic, when introduced into the Persian language, is often replaced by an *h*, and is not voiced. It is often omitted in pronunciation; so it is impossible to judge the original words on this ground alone. When the Arabic text of the *T'ien-fang-li-yüan* is studied, the ending is not a *t*, but is already replaced by an *h*. This fact may indicate that the original author or the copier was a man of Iranian stock. The absence of the ideograph in reproducing this *t* sound in the Chinese transcription may probably be explained by this peculiar Persian method. Consequently, according to the transcription in the *Li-yüan*, the original names would be not *z̲ū 'l-qa'dati, z̲ū 'l-ḥijjati*, but *z̲ū 'l-qa'dah, z̲ū 'l-ḥijjah*. Then the ideograph *t'ou* 頭 (head) prefixed to the transcriptions for the 3rd and 5th months is the translation of *awwal* (masculine form), *ūlā* (feminine form) the Arabic for "the first, initial"; and the ideograph *wei* 尾 (end) prefixed to the transcriptions for the fourth and sixth months is the translation of *ākhir* (masculine form), *ākhirat* (feminine form) the Arabic for "the last, final." These are the only exceptions. In ordinary use, the feminine form is seldom used; the use of the masculine form in the case of the 5th and 6th months does not seem strange at all. The transcriptions in the *Chih-shêng-shih-lu* previously cited may represent the original words reproduced by means of this simpler method.

As to the names of the seven days of the week, they retain the more pronounced tone of the Persian language, for the names of the days are *chih-ch'i-shan-pai* 治起閃白, *tu-shan-pai* 都閃白, *hsieh-shan-pai* 寫閃白, *chao-ho-êrh-shan-pai* 朝合爾閃白, *fan-shan-pai* 潘閃白, *chu-mu-êrh* 主母爾, *shan-pai* 閃白. Despite the fact that the text is all Arabic, all the names except 主母爾 which corresponds to Friday, evidently transcribe, as in the *Ch'i-chêng-t'ui-pu* and the *Li-hsüeh-hui-t'ung*, the original words, namely the Persian words beginning with *Yak-shambah*. Only the ideograph 治 in the first phrase should read *yeh* 冶.

What could be 主母爾 which has replaced 阿的那 (*ādīnah*) the Persian for Friday? The pronunciation *chu-mu-êrh* would readily suggest *jum'at* or *jum'ah* the names of Friday adopted in the Mohammedan calendar. It is needless to say that to Mohammedans Friday, as its word indicates, is a day on which to assemble for devotion, sabbath, and a sacred day, the most significant of the seven days of the week. When borrowing Persian names for the days of the week, to adopt the Arabic for the sacred day alone should spell a profound historical significance. To say nothing of the *Ch'i-chêng-t'ui-pu* compiled in the *Ch'êng-hua* era, and the *Hui-hui-li-fa* compiled by Ma Shaikh in the *Hung-wu* era, even the *Wan-nien-li* at the beginning of the Yüan dynasty compiled by Jamāl ud-Dīn, and later in the early years of *K'ang-hsi* 康熙 in which the *Li-hsüeh-hui-t'ung* was compiled, even the name of the sacred day in Mohammedanism, even though the religion itself was propagated into Iran and the eastern area beyond it, was slighted by calendar scholars of the Iranian school; and the 9th month, the fast and the sacred month to Mohammedans (*Ramaẓān* in the Mohammedan calendar) was called *Āzar* 阿咱而, the old Iranian name for the month, but as in the course of time the names of months came to be replaced by those adopted in the Mohammedan calendar, the convention in connection with the names for the days of the week came to break down and turn formally as well as practically to the Mohammedan calendar. Yet this was realized only in the case of Friday, the sacred day, and the word contained a certain influence of Persian phonetics. The fact that the original compiler of the *T'ien-fang-li-yüan* or the copier was probably a man of Iranian stock has been roughly ascertained; but as to when the book was produced by such a person, it is still to be investigated. The foregoing, however, has, it is hoped, sufficiently proved the traditional potentiality of the Persian language too tenacious to be readily ignored. The above-mentioned *T'ien-fang-chih-shêng-shih-lu* by Liu Chih dated the 2nd year of *Yung-chêng* is the first biography of Muḥammad by a Chinese Mohammedan that was edited after the middle of the reign of the Emperor Ch'ien-lung. It has been pointed out that this book contains Arabic words for the names of months; as to the names of the days of the week, they are given ch'u-jih 初日 *shan-pai* 閃白, i-jih 一日 *yeh-ch'ieh-shan-pai* 葉怯閃白, êrh-jih 二日 *tu-shan-pai* 都閃白, san-jih 三日 *hsieh-shan-pai* 些閃白, ssŭ-jih 四日 *ch'a-shan-pai* 查閃白, wu-jih 五日 *fan-shan-pai* 潘閃白, liu-jih 六日 *chu-mu-êrh* 主母爾. This description, though differing in the accuracy of transcription, may be found to be based upon the same foreign words as in the *T'ien-fang-li-yüan*. The fact that the biography of Muḥammad, the Arabian, the founder of Islamism, was written with the name for the days of the week so spelt by a Chinese Mohammedan should call one's attention in the history of Chinese Mohammedanism, even though the original which formed the basis seems to have been a book in the Persian language.

The general characteristics of the *Hui-hui-li-fa* after the Yüan and Ming dynasties have been roughly presented in the foregoing. When such fundamental

matters as the names of months and the days of the week are taken up, the influence of the Mohammedan calendar resulting from the superiority of the Islam religion itself could not be denied; neither could the tenacious presence of the astronomical ideas of terms in ancient Iran. The so-called *Hui-hui-li-fa* evidently adopted the year of Hijra as its first year. However, because of this fact alone, the *Hui-hui-li-fa* conld not be asserted as the Mohammedan calendar (the calendar of Islamism).(1) On the one hand, it takes up a genuine lunar years like that of the Mohammedan calendar; on the other hand, it also adopts for the purpose of adjusting the system of calculation by means of the sun travelling through the 12 zodiacal constellations, or the solar year which begins at the vernal equinox originated in ancient Babylonia. From this point, the *Hui-hui-li-fa* could not be called a genuine lunar calendar, neither did it belong to the category of the so-called lunar-solar calendar adjusted to the solar year by means of intercalary months; much less could it be called a solar calendar. It was certainly a unique calendar. It was originally an Iranian who compromised the two different calendars; although it was a devise invented to remove the defects of the Mohammedan calendar — a genuine lunar calendar, this would also serve to reveal the originality of the Iranians and their tendency to retain their traditions.

V. Conclusion

The foregoing has been an extremely formal investigation, but it is hoped that it has been an aspect of the character of Islam culture which forced itself into the East. The materials used in this investigation having been the 7 instruments recorded in the *T'ien-wên-chih* of the *Yüan-shih*, the 13 records used by the Hui-hui Astronomical Observatory and the 10 records and 3 astronomical instruments used at the house of the Superintendent of the Observatory, mentioned in the *Yüan-pi-shu-chien-chih*, the plane of observation has naturally been too much on that of physical science. As the next have been the *Ch'i-chêng-t'ui-pu* and the *Ming-i-t'ien-wên-shu*, both books on calendar and astrology, it cannot be denied that too much emphasis has been laid on those subjects. The writer's opinion has been nearly exclusively on matters fundamental and external; the above-mentioned view will involve various problems yet to be solved in the future. Not until thorough-going investigation has been made on these problems, therefore, will the writer be in a position to pass a definite judgment on the opinion presented in this present paper. But if allowed for the time being to bring this humble view to a conclusion within the above-mentioned limits and

(1) The *T'ien-fang-li*, or more strictly the Arabian calendar was not a genuine calendar of Islamism, being saturated with such elements peculiar to the Persian language as specially seen in the names for the days of the week. This has been observed in the *T'ien-fang-li-yüan* and the *Chih-shêng-shih-lu*. Compared with the *Hui-hui-li-fa*, they may be said to be more Arabic and have elements of the calendar of Islamism.

to indicate the direction of future study, the following conclusions may be drawn.

As already stated in the preface, the Islam culture which found its way into the East has usually been regarded as a product of Arabian civilization. Some scholars have identified Hui-hui with Persia, and others considered Hui-hui to be Mohammedans, and Mohammedans to be Arabians. Western culture with which China had to do prior to the Sāsān dynasty, or the T'ang dynasty is Iranian (*i. e.* Persian); in the later times Islam culture full of Arabian colour replaced it; and the position of the Iranian culture was thought to have been completely lost in the history of communications between the East and the West. It is true, there have been previous scholars who have paid attention to the Iranian tendency in Islam culture casually diffused into the East, but even they have failed to point out this element systematically.

With the rising political superiority of the Arabians after the Islam conquest or the downfall of the Sāsān dynasty, Iran with memories of the glorious past in international politics was thrown down to a mere subordinate position; in the face of the triumph of Islam ideology in the realm of thought, especially in that of religion, Iran came to lose everything she had boasted in the past and was forced to prostrate herself before all Arabic sciences headed by its religion. On the other hand, as the Iranians who were proficient in such branches of culture as literature, art, architecture, and industrial art played an important rôle in instructing the Arabs, it is only natural that the products in these branches after they were diffused into the East should have contained marked Iranian colouring. The rôle the Iranians played in the so-called Islam culture should be considered an important one. However, it was a sort of cultural subjugation forced upon them that they had to transcribe their own language with the Arabic letters and to import a large Arabic vocabulary.

Despite this fact, the tradition of Iranian culture cherished from ancient times could not be lost so readily. Iran absorbed and assimilated into her culture such branches of science which the Arabs introduced from the Byzantine Empire and India as the "ancient sciences" or "foreign learnings" and developed in their peculiarly Arabic way, — namely, mathemetics, philosophy, medicine, astrology, alchemy, astronomy, etc., as may be proved by the present writer's remarks in the foregoing, if acceptable on the accounts in the *T'ien-wên-chih* of the *Yüan-shih* and the *Yüan-pi-shu-chien-chih*. The reason why the Iranians naturally not proficient in these subjects, achieved success was probably because they being in the Islam world, sought knowledge extensively probably because they were influenced by cultural stimulation from abroad. As for calendar, it is almost evident now that the so-called *Hui-hui-li-fa* was not the Mohammedan calendar which was a genuine lunar calendar, but one of their own developed through the collateral use of the Persian solar calendar which after the Babylonian adopted the vernal equinox as the beginning of a new year. Especially, it seems to have followed nearly all previous technical terms; and these came

to be introduced into the East and into China. Because placed under Islam rule and forming a link of the so-called Islam world, Iranian culture no doubt had lost the independence which it had enjoyed before Islamism came into being. May it not be said that, though under such a subordinate condition, Iranian culture retained its originality as such? Althogh sharing the same faith of Islamism, the Iranians belonged to the alleged heretic school, the Shī'a, this fact also serves as a ground for such consideration.

This, of course, should not hurry the student to a further conclusion. Not until many other facts have been proved and exactly grasped the actual circumstances of the West after the Yüan dynasty, one could not say for certain. But the present writer is of the opinion that the circumstances of the communication between the East and the West after the Yüan dynasty could not have changed so radically as is generally supposed. It is true, the Arabic colouring is too conspicuous to be disregarded. But the Islam culture diffused into the East was one which had passed through Iranians. So it would follow that as to the position Iranian culture takes in the history of communication between the East and the West, no sharp line could be drawn between the period before the T'ang dynasty and that after the Sung and Yüan dynasties. It might be said that the decisive fall of this position dated from the rise of Christianity into power in modern times. Further investigation as to the processes of reaching this conclusion will be presented at another opportunity for the criticism of the reader.

(*Addenda*) The Arabic and Persian names of the zodiacal constellations are as follows :—

	Ar.	Per.		Ar.	Per.
Aries	Ḥamal	Barrah	Libra	Mīzān	Tarāzū
Taurus	Ṣawr	Gāu	Scorpio	'Agrab	Gazh-dum
Gemini	Jauzā'	Dū-paikar	Sagittarius	Qaus	Kamān
Cancer	Sartān	Khar-chang	Capricornus	Jady	Buz-i-kūhī
Leo	Asad	Sher	Aquarius	Dalw	Dūl-i-āsiyāb
Virgo	Sumblat	Khūshah	Pisces	Ḥūt	Māhī