SOME INDIAN ASTROLABE-MAKERS

Some time back I received a letter from Dr. H. Van Kluber, Asrophysiklichcs Observatorium, Einstein Institute, Potsdam, in which he asked me to throw some light on Zîa'u'd-dîn Muhammad, the maker of an astronomical instrument dated 107 A.H. which is in the Berlin Museum. I have been able to glean some details about Zîa'u'd-dîn Muhammad which I give below, but I shall be grateful to the readers of "Islamic Culture" if they will give me further information on the subject.

The full name of Zîa'u'd-dîn Muhammad is Zîa'u'd-din Muhammad Astrolâbî Humâyûnî Lahôrî. A little digression will explain the significance of the long name.

The most famous instruments of astronomy used in Arabic educational institutions are the globe and the astrolabe. The globe is an instrument not of daily use, but is used only for educational purposes. The astrolabe is used in measuring the height of the sun and other stars, so it is in daily use by astrologers, astronomers, and connoisseurs of the art. It is therefore that a manufacturer of astronomical instruments was called in later times Astrolâbî (اصطرلابی). He could not be appropriately called کروی from کره (a globe), because کروی (spherical) is one of the terms of astronomy. اصطرلابی is not a scientific term of the art. The manufacturer of the astronomical instruments was so called in reference to this instrument.

"*Humâyûnî* is with reference to Humâyûn, who was the successor of Bâbur, the Timurid conqueror of India. The Timurid Sultans always took an interest in astronomy. The grandson of Timur, Mirza Ulugh Beg (who died in 853 A.H.) established a famous observatory at Samarqand, where the renowned astronomers of the period, such as Qâzizâda Rûmî, Ghiyâsu'd-dîn Jamshed and 'Alî bin Muhammad Qaushjî made researches, and the almanac prepared there was named

after Ulugh Beg. Bâbur has mentioned the ruins of the observatory in his Tuzk.

Bâbur's son Humâyûn, whose name is mentioned in connection with astrolabe was a past master in astronomy and astrology. Mullâ Badaûnî writes of Humâyûn in his *Muntakhab-u't-Tawârîkh* dated 1004 A.H.—

"He was matchless in the science of astronomy, astrology and all other strange arts."[1]

Ferishta says:—

"He had much proficiency in mathematics, always associated with scholars and the learned, and constant discussion on learned topics took place in his presence."[2]

The king learnt the art of astronomy from Ilyâs Ardbelî, who was a mastermind in all branches of this science.[3]

During his stay in 'Irâq and Persia the king was accompanied by two famous scholars: one was this very Ilyâs Ardbelî, and the other was Abu'l-Qasim Girjânî. The king was wandering in the wilderness after he had lost the throne of India, still he took lessons from these two scholars of Qutub Shîrâzi's (died 710 A.H.) recondite book Durratu't-Taj (درة التاج) which is a compendium in Persian of scientific theory and practice.[4]

An interesting anecdote is mentioned in the *Akbar-Nâmah*. When Humâyûn reached Tabrîz during his journey in Persia, he ordered his slave Pîk Muhammad Akhtâ Begi to search for a globe (کره) in that old city. کره means colt in Persian. The intelligent slave obeyed the orders by bringing a number of colts to the royal presence. The king laughed when he saw the multitude of colts before him. Abu'l-Fazal begins this anecdote with the following words:[5]

چون به تبریز نزول فرمودند از آنجا که توجه اقدس با اصطرلاب وکره و سائر آلات رصدی درجه کمال داشت .....

(When he reached Tabrîz, there he, who had extraordinary

(1) Vol. I, p. 467, Calcutta.
(2) Vol. I, p. 243, Nawalkishore.
(3) Badaûnî has given his description in his *Muntakhab-u't-Tawârîkh*, vol. III, p. 131, Calcutta Edition.
(4) *Ma'âthir-i-Rahîmî*, p. 612, vol. 1, Calcutta and *Akbar-Nâmah*, vol. I, p. 642, Nawalkishore.
(5) *Akbar-Nâmah*, p. 241, Nawalkishore Press.

excellence in the astrolabe, globe and other instruments of observatory.....).

The king himself gave lessons in astronomy and mathematics like learned teachers. The king's chief associate Nûru'd-dîn Turkhân Sufîdinî (died in 994 A.H.) who was well up in the art, was tutored by the king. Badaûnî says—

"Mullâ Nûru'd-dîn Turkhân Nûrî Sufidinî, the jagirdar of Sufidun in Sindh was a celebrated scholar of arithmetic, mathematics, astronomy and astrology and was one of the confidants and attendants of the lamented king."[1]

Nûru'd-dîn Khân Turkhân is described in *Ma'âthiru'l-Umara* thus:

"The maulâna was noted for his accomplishments, chivalry, and charity. He was fond of astronomy, arithmetic, and the astrolabe. He had a regular association with the Resident of Paradise (Humâyûn). He was one of the many associates and courtiers of Humâyûn. The king was sometimes benefited by his learning but more often than not he derived advantages in mathematics and particularly in the astrolabe from the king who was well versed in these arts."[2]

That the king had an extraordinary liking for astronomy and celestial sciences may be corroborated by the statement of the Turkish naval commander who describes Humâyûn's fondness for these arts in his *Mirâ'atu'l-Mamâlîk*. This naval commander was sent by Sultân Suleymân Khân to drive out the Portuguese from the ports of Gujarat, but his naval expedition ended in destruction and he had to return to his country by land through India, Persia and 'Irâq. Humâyûn wanted this Turkish naval officer, who knew astronomy profoundly, not to go away from him. But the latter persisted in going back to his country, and the king at last permitted him on the condition that he should go after three months of the rainy season when roads were very difficult to pass. In the meantime he must make calculations of solar and lunar eclipses, and help the astronomers of the place in learning the intricate details of the movements of the sun and the axis. He engaged himself in the work and completed the astronomical observations.[3]

(1) Vol. III, p. 197.

(2) *Ma'athiru'l-Umara,* vol. I, p. 478, Calcutta.

(3) Prof. Wembri *Mirâ'atu'l-Mamâlik,* Urdu version, chapter VIII.

Humâyûn's sister Gulbadan Begum, the authoress of the *Humâyûn-Nâmah* tells on one occasion how Humâyûn himself once fixed the auspicious date for a marriage by making astral calculations. She writes:

" In short, after forty days in the month of Jamâdi-ul-Awwal, 948 A.H. at Yatur on Monday noon, His Majesty the King took the astrolabe in his hand and fixed the fateful hour."[1]

Humâyûn had such an ardent love of mathematics and mathematical instruments that his friend Commander Beiram Khân Khânkhâna composed a Qasîdah in his honour, in which the astrolabe is fully described.

آن چرخ چیست کا مده برخورش مدار آن بدر کز میان شهابش کند گذار
با آنکه می کند به مه وخور برابری آمد بجان زحلقه بگوشان شهریار
نارد بچشم کو کبه آفتاب را چون مهچه لوائے شهنشاه نامدار
پیوسته آسمان و زمین زیرحکم اوست همچون نگین خاتم شاه جم اقتدار
برکف نهاده خوان زری پرز اشرفی تابر قدوم اشرف شاهان کند نثار
شاه بلند قدر همایون که از شرف بردر گهش سپهر نهد روی افتقار

(بدایونی، جلد سوم صفحه ۱۹۲ کلکته)

In this Qasîdah چرخ (Sky) محور (Axis) مدار (Circumference) حلقه (Halo), خور (Sun) شهاب (Meteor) بدر (Full Moon) آفتاب (Sun) آسمان (Sky), زمین (Earth), شرف (Height), سپهر (Sky), are various astronomical terms.

It is generally known that Humâyûn died of a fall from the stairs of his library. But the truth is that in old Delhi Shêr Shâh had built a very high three-storeyed building which was known as Shêr Mandal. On the third storey was a bastion which was higher than all the buildings.[2] The king had converted it into a library, because its height served the purpose of an observatory. In the evening of the day when he fell, he believed that the planet Venus would appear. The king was busy there in discussion with some mathematicians and was awaiting the appearance of the planet when the evening prayer call was heard. He was going hurriedly when

(1) p. 53, London.

(2) Sir Syed's *Atharu's-Sanâdîd*, p. 51, Cawnpore.

he slipped off. He fell down and was hurt. The injury was fatal.

The author of the *Akbar-Nâmah* writes:

"On the last day he went upstairs to his library..... He called for a group of mathematicians. That night the planet Venus was to make its appearance and he wanted to see it."[1]

All the work of the king was performed on astronomical principles. The different functions of the court on various days were divided on an astrological basis. Ghiyâthu'd-dîn, in his *Humâyûn Nâmah* and Abu'l-Fazal in his *Akbar-Nâmah* have given full details[2] of these days which were apportioned astronomically. The organization of the court, the camp and the orchard was also made on these scientific principles. He had erected pavilions for the court in which the nine skies of the Greek astrology and the different stars of each sky were emblematically represented.

Humâyûn took immense interest in such innovations. He had made a بساط نشاط , where all the celestial circles and spherical elements (کرات عناصر) were to be seen. The first which was ascribed to the unspotted sky was white. The second was blue (کبود). The third, which was proper to Saturn was black. The fourth was sandal-like with reference to Jupiter. The fifth was red as Mars. The sixth was golden like the Sun. The seventh was green in relation to Venus. The eighth was bluish as Mercury. The ninth was white like the moon. After this there were figures of the four elements. Of these there were maps of the seven realms in the terrestrial globe. The colour of the public Court-hall changed each day according to the colour of the daily star as fixed by astrologers. He had likewise made a pavilion with the twelve signs of the Zodiac. He had made up his mind to build observatories at many places and had prepared various instruments for the purpose.[3] Among these various instruments there was the astrolabe.

(1) *Akbar-Nâmah,* Nawalkishore, p. 399 and *Ma'âthir-i-Rahîmî,* vol. I, p. 609, Calcutta.

(2) *Akbar-Nâmah,* Nawalkishore, p. 399.

(3) Elliot's *History of India,* vol. V, p. 116.

In March and May 1909—i.e., some twenty-five years ago—I wrote an article in *Al-Nadwa*,[1] Lucknow, on "Muslims and Astronomy." I had for the first time made mention of Zîa'u'd-din Humâyûnî Astrolâbî. I wrote in that connection:—

"It was Humâyûn who made the astrolabe in vogue in India. Humâyûn was a mastermind in astronomy. He had invented a special kind of astrolabe, which was called Humâyûn's astrolabe (اصطرلاب ہمایونی). In the library of the Nadwa there is an old astrolabe which bears the following inscriptions.

عمل ضیاء الدین محمد بن قائم محمد بن ملا عیسی بن شیخ الهداد اصطرلابی همایونی

لاهوری سنه ۱۰۵۹ھ

(The work of Zîa'u'd-dîn Muḥammad, son of Qâ'im Muḥammad, son of Mullâ 'Isâ, son of Sheykh Allah Dâd, Humâyûnî Astrolâbî, Lahôrî, 1059 A.H.)

I am sorry to say that this statement of my article finds no corroboration in any book, although from that time onward I have been making earnest researches for it. The learned Maulâna Ghulâm Huseyn of Jaunpur (1250 A.H.) writes in his *Jam'-e-Bahâdur Khânî*: "the *mechanics of the later period*[2] made these changes." It would be no wonder if the *later period* might refer to this very Humâyûn's astrolabe.

The mechanics who manufactured astronomical instruments, maps and globes for Humâyûn are not mentioned in any history. Only Maulânâ Maqsûd Herwaî is mentioned in *'Aîn-i-Akbarî*:—

"He was one of the lovers of the Resident of Paradise (جنت آشیانی).... He manufactured astrolabes, globes and other instruments which took the people who saw them by surprise."

I have not been able to find any description of Zîa'u'd-dîn and his family in any history or biography. It is however clear from the name and genealogy inscribed in the globes and astrolabes manufactured by Zîa'u'd-dîn and his father Qâ'im Muḥammad that Zîa'u'd-dîn's great-grandfather Allah Dâd was a mechanic of Humâyûn's reign who manufactured globes and astrolabes after Humâyûn's fashion (همایونی طریق).

(1) *Al Nadwa*, March 1909, p. 24.
(2) *Jam'-i-Bahâdur Khânî*, p. 501, Calcutta.

Accordingly in the library of Nawab Sir Salar Jung Bahadur (Hyderabad), there is an astrolabe, which bears the following inscriptions

ت استاذالهداد اصطرلابی لاهوری فی سنه ۹۷۵ ه

(Work of Master Allah-Dâd, the Astrolabe-maker of Lahôre, dated 975 A.H.).

I have discovered the following manufactures of Zîa'u'd-dîn and of his father Qâ'im Muḥammad.

There is one astrolabe made by Qâ'im Muḥammad in Calcutta which belongs to Qâzi Obeidu'l-Bârî.* It bears the following inscription.

عمل قائم محمد بن عیسی بن الهداد اصطرلابی همایونی ۱۰۳۴ ه

(The work of Qâ'im Muḥammad, son of 'Isâ, son of Allah-Dâd, Astrolâbî, Humâyûnî, 1034 A.H.). On the other corner of this astrolabe is written the "21st year of Jahângîr's accession."

An astronomical globe of his is found in the Oriental Library, Bankipore, which reads thus

صنعة اقل العباد قائم محمد ابن عیسی ابن الهداد اصطرلابی لاهوری همایونی سنه ۱۰۴۷ ه

(The work of the humblest creature, Qâ'im Muḥammad, son of 'Isâ, son of Allah-Dâd, Astrolâbî, Lahôrî, Humâyûnî 1047 A.H.).

On the other side of the globe is the following inscription.

تمت این کره مکمل مشتمل بیك هزار وبست ودو کواکب که جمیع از ان چهل وهشت صورت مرصوده نموده اند. اهل (؟) علماء وحکماء تنجیم چنانچه مرصوده در رصد مرزا الغ بیگ است، وبر تقویم هرکوکب ثابته سه درجه زیاده کرده ایم بحساب حکماء وعلماء این فن تابا ین تاریخ سنه ۱۰۴۷ ه

This globe is made of pure brass metal. There is a silver nail near each star and all Zodiac signs are made therein.

Vol. I, p. 31, Nawalkishore.

*He comes of an old family of Calcutta. I am indebted to Prof. Maḥfuzu'l Haqq of the Presidency College, Calcutta, for my information concerning this astrolabe.

I have come to know of the following globes and astrolabes of Qâ'im Muḥammad's son, Zîa'u'd-dîn, which I mention here in chronological order.

1. His oldest manufactured astronomical globe is to be found with Maulvi Yusuf Sahib of Phulvari District, Patna. It is of pure brass. There is a silver nail near each star. It weighs $1\frac{1}{4}$ lb. This family is in possession of this globe since 1238 A.H. The globe bears the following inscription:

عمل ضیاء الدین محمد بن قائم محمد بن ملا عیسی ابن ملا الهداداصطر لابی همایونی لاهوری فی سنه ۱۰۵۸ھ

(The work of Zîa'u'd-dîn Muḥammad, son of Qâ'im Muḥammad, son of Mullâ 'Isâ, son of Sheykh Allah-Dâd, Astrolâbî, Humâyûnî, Lahôrî, 1058 A.H.)

2. After this comes his astrolabe which is preserved in the library of the Nadwatu'l-'Ulamâ, Lucknow. It bears the name and date:—

عمل ضیاء الدین محمد بن قا ئم محمد بن ملا عیسی بن شیخ الهداد اصطر لابی همایونی لاهوری سنه ۱۰۵۹ھ

(The work of Zîa'u'd-dîn Muḥammad, son of Qâ'im Muḥammad, son of Mullâ 'Isâ, son of Sheykh Allah-Dâd, Astrolâbî, Humâyûnî, Lahôrî, 1059 A.H.)

3. Another astrolabe of his is in the Library of Nawab Sadar Yar Jung, Maulâna Habîbu'r-Rahmân Khân Sherwânî (Habib Ganj, District Aligarh). The date and inscriptions are thus:—

عمل اقل العباد ضیاء الدین محمد ابن قائم محمد ابن ملاعیسی ابن شیخ الهداد اصطر لابی همایونی لاهوری فی سنه ۱۰۶۴ھ

(The work of the humblest creature Zîa'u'd-dîn Muḥammad, son of Qâ'im Muḥammad, son of Mullâ 'Isâ, son of Sheykh Allâh-Dâd, Astrolâbî, Humâyûnî, Lahôrî, in 1064 A.H.)

4. A globe made by him in the same year was in the possession of a physician of Rampur, but is now in the Tibbîyah College, Aligarh. It bears the following inscription:

عمل اقل العباد ضیاءالدین محمدبن قائم محمدبن ملاعیسی ابن شیخ الهداداصطر لابی همایونی لاهوری فی سنه ۱۰۶۴ھ

(The work of the humblest creature Zîa'u'd-dîn Muḥammad, son of Qâ'im Muḥammad, son of Mullâ 'Isâ, son of Sheykh Allâh-Dâd, Astrolâbî, Humâyûnî, Lahôrî, dated 1064 A.H.)

5. The fifth existing work of his is the globe which is mentioned by Dr. Kluber, a photo of which he has sent me. This is in the Berlin Museum. It reads thus:—

عمل اقل العباد ضیاء الدین محمد ابن قائم محمد ابن ملا عیسی ابن شیخ الهداد اصطرلابی
همایونی لاهوری فی سنه ۱۰۷۱ ه

(The work of the humblest creature Zîa'u'd-dîn Muḥammad, son of Qâ'im Muḥammad, son of Mullâ 'Isâ, son of Sheykh Allâh-Dâd, Astrolâbî, Humâyûnî, Lahôrî, dated 1071 A.H.)

In addition we know of four other astrolabes made by him, which are all dated 1074 A.H. and are to be found in Europe and India.

6. One of them is with Maulâna Abu Bakar of Jaunpur (Chairman of Theology, Muslim University, Aligarh). It is comparatively smaller and bears the following legend:—

عمل اقل العباد ضیاء الدین محمد بن قائم محمد بن ملا عیسی بن شیخ الهداد اصطرلابی
همایونی لاهوری فی سنه ۱۰۷۴ ه

(The work of the humblest creature Zîa'u'd-dîn Muḥammad, son of Qâ'im Muḥammad, son of Mullâ 'Isâ, son of Sheykh Allâh-Dâd, Astrolâbî, Humâyûnî, Lahôrî, dated 1074 A.H.)

7. Another is in the official library of Rampur. Its inscription has become a little disfigured but is legible:—

عمل اقل العباد ضیاء الدین محمد بن قائم محمد بن ملا عیسی بن شیخ الهداد ....
سنه ۱۰۷۴ ه

(The work of the humblest creature Zîa'u'd-dîn Muḥammad, son of Qâ'im Muḥammad, son of Mullâ 'Isâ, son of Sheykh Allâh-Dâd,.....dated 1074 A.H.)

8. The third astrolabe of the same date was exhibited in the Persian Arts Exhibition held in London in 1931 A.D. Its descriptions may be found on page 193 of the printed catalogue of the Exhibition—It has the following inscription:—

عمل اقل العباد ضیاء الدین محمد بن قائم محمد بن ملا عیسی بن شیخ الهداد اصطرلابی
همایونی لاهوری فی سنه ۱۰۷۴ ه

(The work of the humblest creature Zîa'u'd-dîn Muḥammad, son of Qâ'im Muḥammad, son of Mullâ 'Isâ, son of Sheykh Allâh-Dâd, Astrolâbî, Humâyûnî, Lahôrî, dated 1074 A.H.)

The compiler of the catalogue has made a mistake in reading the name of Allâh-Dâd. The name of the Indian which is a combination of Allâh (الله) and Dâd (داد) and which means 'Gift of God' has erroneously been read (الحداد) (Al-ḥaddâd) which means in Arabic 'blacksmith.' Al-ḥaddâd was thought right because of the mechanism of the brass, but this is altogether wrong.

9. The fourth astrolabe of the same date is in Bankipore Library. It is very big. It bears the following inscription:—

عمل اقل العباد ضیاء الدین محمد بن قائم محمد بن ملا عیسی بن شیخ الهداد اصطرلابی

همایونی لاهوری فی سنه ۱۰۷۴ ه

(The work of the humblest creature Zîa'u'd-dîn Muḥammad, son of Qâ'im Muḥammad, son of Mullâ 'Isâ, son of Sheykh Allâh-Dâd, Astrolâbî, Humâyûnî, Lahôrî, dated 1074 A.H.)

From the above information and the inscriptions we come to the following conclusions:—

That they belonged to Lahore (Punjab). Genealogically, Zîa'u'd-dîn's grandfather was Mullâ 'Isâ, whose father was Sheykh Allah-Dâd. From the word Mullâ (ملا), it is obvious that they were men of education. Badaûnî describes one Sheykh Allâh-Dâd Langer Khânî Lahôrî in the following words:—

"A ward of the city is named after him (Muhallah Langer Khân is still a part of the city of Lahôre). He was well-versed and efficient in various branches of learning..... He gave lessons and never went to the houses of the rich nor solicited help from kings, nor begged favour of anyone for his livelihood. His age is about eighty years."

Badaûnî wrote his book in 1004 A.H. So the birth of Sheykh Allâh-Dâd may be believed to have taken place in 924 A.H. Accordingly this man may have been a young man of twenty-five or thirty in Humâyûn's reign. This man, however, cannot be positively said to be Zîa'u'd-dîn's great-grandfather Sheykh Allâh-Dâd.

Zîa'u'd-dîn and his ancestors may be chronologically placed with the Muslim kings of India thus:—

1. Sheykh Allâh-Dâd	1. Humâyûn	937–963 A.H. / 1530–1555 A.D.
2. Mullâ 'Isâ	2. Akbar	963–1014 A.H. / 1555–1605 A.D.
3. Qâ'im Muḥammad	3. Jahângîr	1014–1036 A.H. / 1605–1626 A.D.
4. Zîa'u'd-dîn Muḥammad	4. Shâh Jahân	1036–1068 A.H. / 1626–1665 A.D.
	'Alamgîr	1068–1118 A.H. / 1675–1706 A.D.

Of these we have got the dates of only two, and the two are right according to this approximation. Qâ'im Muḥammad's first astrolabe is dated 1034 A.H. (the 21st year of Jâhangîr's accession). His second globe is dated 1047 A.H. This proves that he lived in the reigns both of Jahângîr and Shâh Jahân.

Zîa'u'd-dîn's first globe is dated 1058 A.H. and his last is dated 1074 A.H., which shows that the period of his activity as a craftsman lasted for at least seventeen years.

That they made instruments in such abundance proves that they were not amateurs in astronomical arts nor learned professors of any institution but were professional manufacturers. They manufactured at least four astrolabes in one and the same year, e.g., one astrolabe and one globe are dated 1064 and four astrolabes are dated 1074 A.H.

Dr. Kluber writes in the course of his letter that Zîa'u'd-dîn or his globe might probably have some connection with Raja Jai Singh Sawai's observatory, but this is not historically true. That observatory was constructed by the order of Muḥammad Shâh by Jai Singh, the Chief of Jaipur and Subedar of Agra and Malwa in 1137 A.H. (1724 A.D.), that is, sixty years after the Berlin globe, and seventy-nine years after the first-made globe which is now in Phulwari District, Patna.

SYED SULAIMAN NADVI.