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Maragheh: *Heaven's Gate*

Space Age began in 1957 following the launch of Sputnik, the first man-made satellite, to space by Soviet Union. About three years later I was born on 21st August 1960 at the dawn of Space Age in Maragheh (**Marāghé** or **Marāgha**), the city situated in north west of Iran and famous for its ancient observatory and Khajeh Nasir al-Din al-Tusi the founder of the observatory.

Since early days of childhood my father tried to acquaint me with the wonders of space and the configuration of celestial bodies at night sky. Listening to the talks and descriptions of father about the strange phenomena in deep space was the wonderful and fascinating things that have engraved in my mind.

My father, Ahmad Tarikhi, played a key role in my interest and actuating me to space.
(image credit: author)

Father, basically a teacher at his young age, was banished to continue working following the coup d'etat of 1953 in Iran. He later worked in the notary publics of Maragheh until he retired. Past history of my birthplace has excited me always, particularly the remnants of Maragheh Observatory placed 2 kilometers of the city at the top of the hill in west called Talebkhan. When I was a teenager I was always walking from home towards the hill at the top of which situated the observatory's remnants. It was a great amusement for me for long time. I had the opportunity to exercise both physically and mentally. Perhaps it is hard to believe that this son of the Space Age two decades later became the only and first contemporary Iranian to work in the capacity of Bureau Member of the highest and greatest global entity responsible for the peaceful uses of space, so called United Nations Committee of Peaceful Uses of Outer Space (COPUOS). In June 2003 I was selected by consensus of all members of COPUOS to work in the position of Second Vice Chairman of Committee from 2004 to 2006. I believe that my wonderful birthplace and my father were the key and effective factors in directing me to such career of space science and technology, which I selected it, trough studying physics both in Tehran and Knightsbridge Universities (click here to read more). Academic studies caused I leave my birthplace at 18; I began to study Physics in Tehran University then the best and highest place for studying Physics in Iran. Although since then I have had the opportunity to only visit Maragheh almost one or two times a year my memories about it has not forgotten and my interest to it is getting enhanced more and more. In summer 2007 I traveled to Maragheh and I had the opportunity to review and organize my mind and thoughts and compare with what I observed in my one-week stay there. This illustrated article tries to describe the current and past of Maragheh from the eyes of a person who believes that Maragheh has actually been the gate for his progress and advancement.

Maragheh, as seen from space
(images credit: Google Earth, image set-up: author)

Nature, culture and society

Maragheh at the elevation of 1,619 meters above sea level is a city in northwestern Iran with more than 300,000 inhabitants in the East Azerbaijan Province. It is actually an ancient city situated in a narrow valley running nearly north and south on the southern slopes of Mount Sahand whose ridge 3,722 meters above sea level protects the town from the harsh winter coldness experienced in Tabriz.

Sahand Mountain in north east of Maragheh

The city is situated at the eastern extremity of a well-cultivated plain opening towards Lake Orumiyeh, which lies 22 kilometers to the west. Maragheh is based on the bank of the Safi Chai River. Extensive vineyards and orchards, all well watered by canals led from the river, and producing great quantities of fruit, surround the city. It is the trade and transportation center for exporting both fresh and dried fruits. The hills west of the town consist of horizontal strata of sandstone covered by irregular pieces of basalt.

Safi Chai; upstream view, it is now trapped behind the Alavian Dam in north of the city.

For more than a decade the Alavian Dam in northwest of the town acts as the reservoir for the water from Safi Chai. Maragheh is linked by road to Tabriz, 130 kilometers north, and Teheran, 535 km east. Since decades ago railway has been the traditional linkage mean between Maragheh, Tabriz, Tehran and other cities in between. The Airport of Maragheh receives few weekly flights from Tehran and vice versa.

The lake behind the Alavian Dam
(image credit: author)

Maragheh is very rich in natural and cultural resources. In the central part of the city the old architectural structures were preserved for years however, in the very recent times the rise in land and real estate price has persuaded the owners of the old constructions to rebuild the houses in new fashion and change the pattern of settlement at the town. The tranquility and privacy of the old houses with great yards full of green plants, flowers and fruit trees provide wonderful and fantastic moments specially in dawn and late in the evening to relax, enjoy and think about the beauty and charm of life and existence. This is the specific and frequent experience and memory of mine in addition to other sweet and odd memories when living in Maragheh in childhood and teenage.

Main street of Maragheh famous to Khajeh Nasir Street that still keeps its traditional form. There is a plan to build a modern street parallel to this street at the vicinity
(image credit: author)

The city at rush; at daytime the main street is active and sometime in the evening very crowded.
(image credit: author)

The view of a traditional workshop-store and my uncle who the workshop-store belongs to him; the inset shows my late grandfather, Abdul Hussein Ravandi, who owned this workshop-store earlier. He was a perfect and reputable craftsman of pride for Maragheh. Some aged people keep his handicrafts with honor and pride. A number of his handicrafts is said to be kept at one of the Moscow museums in Russia.
(image credit: author)

Maragheh's traditional bazaar is worth visiting. There is large number of workshops and stores in which city's craftsmen work and sell the products of their art and talent. Modern businesses also emerge in Maragheh. There are many leisure places around the city among which the mineral water springs such as Varjovi, Gushayesh, Sari Su, Shour Su, and Okouz Boughaz worth to be mentioned. There are very many picturesque areas around the Alavian Dam that attracts the attention and interest of the visitor.

Beautiful view of the lake behind Alavian Dam, above; the view of the Ashan village on Safi Chai, below
(image credit: author)

Its marble, which is known throughout Iran as Maragheh marble, is a travertine obtained at the village of Dashkasan near Azarshahr about 50 kilometers north-west of Maragheh. It is deposited in the water that bubbles up from a number of springs in the form of horizontal layers, which at first are thin crusts and can easily be broken, but gradually solidify and harden into blocks with a thickness of about 20 centimeters. The marble is a very beautiful substance in pink, green, or milk-white colors, streaked with reddish copper-colored veins. It is exported and sold worldwide under such the names as Azarshahr Red or Yellow marble.

Past of Maragheh

Maragheh is one of the oldest and the most historic valuable towns of Iran. In 7th century the region of Maragheh was conquered by Arab Muslims. During the liberation battles of Babak Khorramdeen with Arabs, the town was the headquarters of the Arab army. After the Arab conquest in the 7th century Maragheh developed rapidly as a provincial capital. In 1029 it was seized by the Oghuz Turks (Seljuqs), who developed it into an important city, but a Kurdish chief who established a local dynasty drove them out. The Mongols destroyed the city in 1221, but Hulaku Khan held court there until the establishment of a fixed capital at Tabriz. Maragheh basically has a firm connection with the Mongols Dynasty, who made it the capital of Azerbaijan for some time, presumably due to the excellent grazing for their countless horses, and between 1259-62, in the time of Hulaku, built an astronomical observatory and a university for Khajeh Nasir al-Din al-Tusi, in 15 years and within a distance of 2 km to the west of the town. In 1256 Maragheh was selected by Hulaku Khan (1217-1265) as the capital of the Ilkhanate Empire ruling over most of Persia. Shortly thereafter it became the seat of the Church of the East Patriarch Mar Yaballaha III.

The city was temporarily occupied by Russia in 1828. From 1914 to 1917, Maragheh was the site of fighting between the Ottomans and the Russians; the fight that stopped as a result of the Bolshevik Revolution in Russia in October 1917 and establishment of the Soviet Union. During the World War II, Maragheh was under the governance of a local state that was supported by the former Soviet Union for nearly a year.

There are still many historical remaining from Hulaku Khan Epoch in Maragheh. From the many historical places of Maragheh the following could be mentioned:

- The Historical Castle of Qizlar Qalasi, which belongs to the later Sassanid and the earlier Islamic period.
- The Remnants of the Maragheh Observatory, which belongs to the Hulaku Khan Epoch.

Remnants of Rasad Khaneh

- Five Domes called Sorkh (Red Dom, that was build in 1147), Kabud (Gray), Modawwar (Circular), Ghaffareyyeh, and Guei Borj (Blue Tower) which belongs to the Mongols Epoch from the 12th and 13th centuries

Gonbad-e Kabud or Guei Borj

- Cave of Kabootar which is located in the south-east of Maragheh
- Old Mosques of Molla Rustam, Moezel Deen, Shaykh Baba, as well as Maragheh Jami' Mosque that all belongs to different Islamic periods
- The Tomb of the famous Azerbaijan poet, Owhadi Maragheh

- Masters' Tomb in East of Maragheh

Outer and interior views of Masters' Tomb
(image credit: author)

- Mehr Temple that belongs to the 7th Century B.C.

Mehr Temple that belongs to 27 centuries earlier

Maragheh Observatory

Maragheh Observatory (Rasad Khaneh in local language, Azerbaijani) is an ancient observatory, which was established in 1259 by Khajeh Nasir al-Din al-Tusi (1201-1274), the remarkable Iranian scientist and astronomer. Rasad Khaneh was once the most prestigious observatory in the world; it still preserves its magnificence and glory on the western hills of Maragheh called Talebkhan Hills.

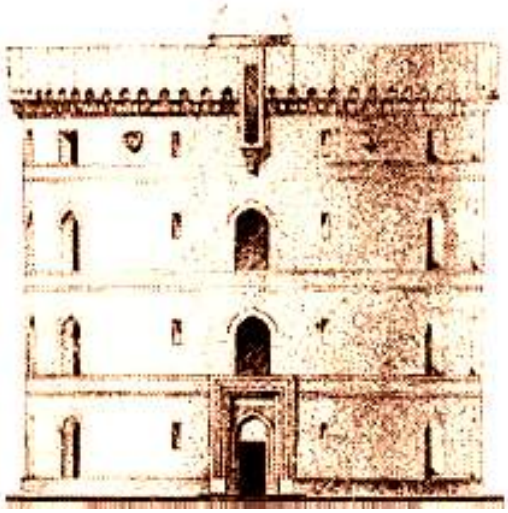
Talebkhan village as seen from the site of Maragheh Observatory
(image credit: author)

A considerable archaeological and historical studies as well as groundwork have been made on the remnants of Maragheh Observatory.

The board introducing Maragheh Observatory at the entrance to the site
(image credit: author)

It is now revealed that the Observatory was a four-story circular stone building of 28 meters of diameter constructed in a 340 to 135 square meters citadel like area. The mural quadrant to observe the positions of the stars and planets was aligned with the meridian, which served as Prime Meridian (reference meridian) for the tables in the Zij-i Ilkhani, an astronomical almanac; nowadays the reference meridian is the one, which passes the Royal Greenwich Observatory in the United Kingdom.

Close view of Maragheh Observatory



Maragheh Observatory Sketch; it was a four-story circular stone building of 28 meters of diameter

In 1253 AD, the Mongols began their invasion to Persia and the Caucasus. This event, as strange as it may sound, was very beneficial for Khajeh Nasir, who was held captive at Alamout, in Qazvin for many years by the Assassins-a religious clandestine terrorist group ruling in Persia and led by Hassan Sabbah. The Mongolian occupation led to release of Khajeh Nasir and his freedom.

It is said that it was Khajeh Nasir who persuaded Hulaku Khan to continue his attack to Baghdad and destroy the Abbasid Caliphate there. The Khan succeeded in 1258 and afterwards made Khajeh Nasir one of his personal advisors.

Hulaku then made Azerbaijan the center of his huge state, which was known as Mongolian Ilkhanid Dynasty (Ilkhani means "People's Khan" in Azerbaijani language). Maragheh, an ancient cultural center became the first capital that later on it was changed to Tabriz.

Hulaku Khan believed that much of his military successes were due to the advice of astronomers (who were also astrologers), especially of Khajeh Nasir al-Din al-Tusi.

Khajeh Nasir, Khan's advisor who was a scientist at the same time, benefited Hulaku's belief in astrology and persuaded him to build an observatory in Maragheh. He convinced Hulaku that he could only guide the destiny of the Mongols if a huge observatory and a library to house enormous volumes of books were constructed. Furthermore, when Khajeh Nasir complained that his astronomical tables are outdated, Hulaku authorized building the observatory in a place of Khajeh Nasir's choice. According to books such as Rashidi's Jam-e-ttavarikhe the building of the Rasad Khaneh started in 1259 (657 A.H.). It became operational in 1262 and had various instruments, which was the invention of Khajeh Nasir himself. He also designed other instruments for the Observatory, which was far more than a center for astronomy. The library of the observatory contained 40.000 books on wide range of scientific topics in addition to astrology and astronomy, while work on mathematics and philosophy were vigorously followed there.

Khajeh Nasir al-Din al-Tusi
(1201 – 1274 A.D.)

Reportedly the idea of building Maragheh Observatory has its specific story, as was recorded by the well-known historian, Haji Khalifa, in his book, "A Book about the World". When Khajeh Nasir proposed the idea of constructing an observatory that was an expensive undertaking as well, the Khan asked Khajeh Nasir, "…why do we need an observatory?" "…is the science about the stars so important that we should spend such a great amount of money?" Khajeh Nasir replied, "…allow me

to carry out an experiment. Let's arrange for someone secretly to go up this high hill and throw down a large empty caldron." Khan accepted and so they did. When the caldron came down tumbling, it produced such a terrible noise that the Khan's soldiers panicked. Khajeh Nasir then explained, "…we know the reason for all this clamor, that's why, …and so it is, if we know the secrets of the celestial phenomena, we will be calm on the Earth." Hulaku Khan then agreed and allocated 2,000 dinars for construction of an observatory, which would be the largest in the East. Construction began in 1259 and was carried out primarily by Mu'ayyid al-Din al-Urdi and his son, Mahmud. Such the wise and clear vision of Khajeh Nasir about the Universe and the importance of knowledge about it about 750 years ago is the indication of his obvious genius and sapience.

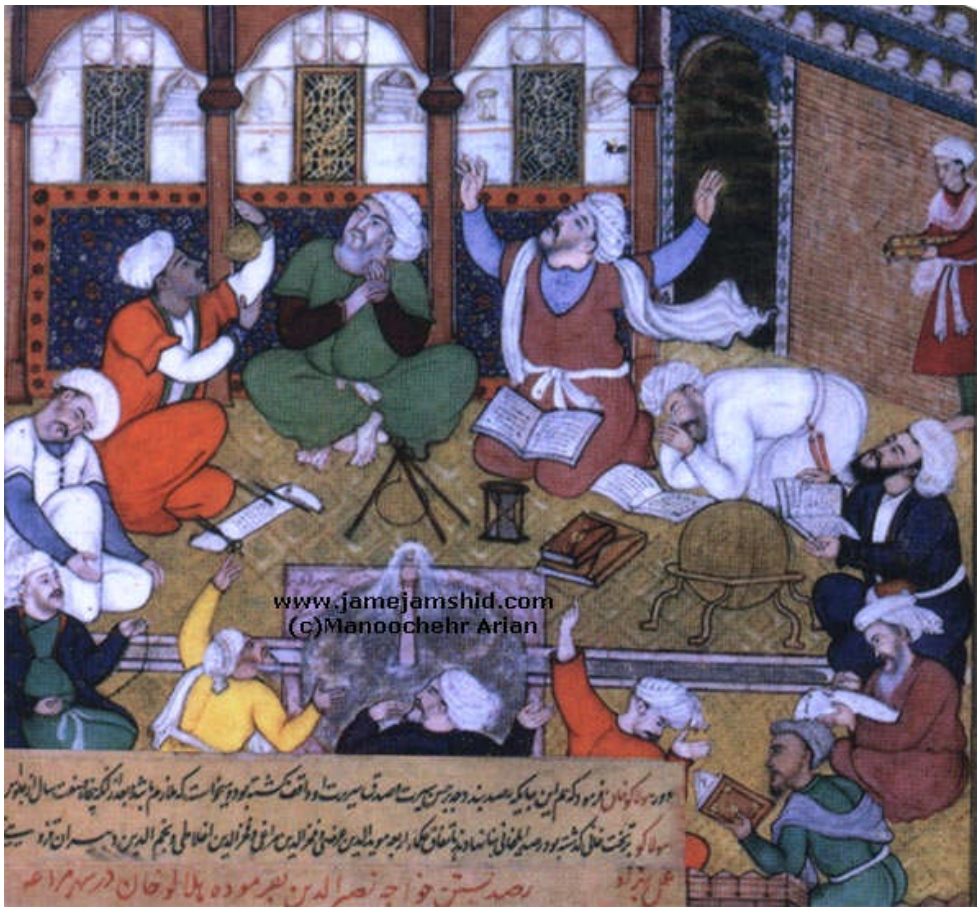
A number of other prominent astronomers worked with Khajeh Nasir there such as Muhyi al-Din al-Maghribi, Mu'ayyid al-Din al-Urdi from Damascus, Qutb al-Din al-Shirazi, and Hulaku's Chinese astronomer Foal Munji whose Chinese astronomical experience brought improvements to Ptolemaic system used by Khajeh Nasir.

Khajeh Nasir's geometrical technique called as Tusi-couple for his planetary models

Khajeh Nasir invented a geometrical technique called as Tusi-couple for his planetary models, which generates linear motion from the sum of two circular motions. He also determined the precise value of 51 arc-second for the annual precession of the equinoxes and contributed to the construction and usage of some astronomical instruments including the astrolabe. After 12 years of intense work by Khajeh Nasir and other prominent scientists the observations and planetary models were compiled in the Zij-i Ilkhani, which clearly influenced Copernicus studies. The tables were published during the reign of Abaqa Khan, Hulaku's son, and named after the founder of the observatory. The tables were commonly at use until the 15th century. It is not known definitely by when the Observatory had been active, however it is guessed to be active until about seven centuries ago. It was destroyed and turned into ruins as a result of frequent earthquakes and lack of state care and attention in different epochs. After suppressing the riot of Mokri Tribe supported by the Ottoman Sultan Morad the Third, Shah Abbas the Great arranged for repairing the Observatory, however, because of the king's early death it was not commenced. The remnants of the Observatory inspired Ulugh Beg 172 years later to construct his observatory in Samarkand in 1428. Hulaku's elder brother, Khublai Khan also constructed an observatory, the Gaocheng Astronomical Observatory in China.

Maragheh Observatory had been the first largest center in the world before the use of telescope in astronomical studies. Observatories in Samarkand and India had been modeled upon Maragheh

Observatory. The observatory had been a treasury of archeology and science. The Observatory later provided a model for a similar building in Beijing. It was known to have housed an exceptionally large library and a school for training specialists. Khajeh Nasir collected famous scientists of the date to be involved with the construction of the instruments as well as actual observations. Many nationalities including Arabs, Azerbaijanis, Chinese, Georgians, Mongolians, Persians, Turks and also Jews were involved with the work of the Observatory. This is the mark of Khajeh Nasir's high conceive about the vitality of implementing such the endeavor in global and multinational level. Khajeh Nasir was a man of exceptionally broad knowledge. He was born in 1201 in Tus at Khorasan Province near the city of Mashad, Iran (Persia at that time). He became quite influential in the Eastern cultures and science, and wrote more than 100 works in Persian and Arabic, then the language of Near Eastern science, however, Khajeh Nasir also wrote poems in Persian. Most of his works provide a well-consolidated account of what others had previously accomplished, many of which became the standard in a number of disciplines up until contemporary times. However, Khajeh Nasir made also substantial contribution to knowledge himself. Most of the researchers presently consider him basically a mathematician. His works played a great role in the development of geometry and trigonometry not only in the East but also in Europe. It was Khajeh Nasir who presented trigonometry as an individual science for the first time in the world. He also wrote on astronomy, physics, medicine, philosophy, ethics, and logic. He improved upon and revised earlier Arabic translations of Avicenna (Canon of Medicine), Euclid (Elements), Ptolemy (Almagest), Autolycus, Theodosius, Apollonius and others. It is worth to mention that Khajeh Nasir made the most significant development of Ptolemy's model of the planetary system up to the development of the heliocentric model in the time of Copernicus, as mentioned in the Copernicus "De Revolutionibus".



An image from the book Zij-i Ilkhani written by Khajeh Nasir al-Din al-Tusi shows the Khajeh Nasir Tusi Group or Maragheh Observatory Group at work in the Observatory. The major members of the group headed by Khajeh Nasir were Mu'ayyid al-Din Orouzi, Fakher al-Din Maraghi, Fakher al-Din Ekhlati, Najm al-Din Dabiran.

About 20 of his works make contributions to the fields of mathematics and astronomy. The most famous is "The Astronomic Tables of Ilkhans" in four volumes, which is a compilation of the research carried out at the Maragheh Observatory. His most popular book dealt with ethics, “Akhlagi Nasiri”.

Khajeh Nasir demised on June 25, 1274, in Baghdad. The calligraphic inscription on his grave reads: “The helper of religion and people, the King of the country of Science-such a son had never been born before.”

Maragheh Observatory over the Talebkhan Hill
(image credit: author)

In recent years it is paid large attention by the world community to commemoration and hail of Khajeh Nasir and Maragheh Observatory while the state is concerned to protect the remnants of the observatory. To save the remains of Maragheh observatory from further destruction, recently Iran's Cultural Heritage and Tourism Organization (ICHTO) mounted a dome-framed shelter of brass over it that can be seen from remote distance. This structure protects the remnants from different risks such as seasonal and climate changes. The dome is also planed to hold an exhibit of astronomical devices used at Maragheh Observatory.

In front of the dome-framed shelter of brass over the remnants of Maragheh Observatory in summer 2007; from left to right: my wife, a relative and I
(image credit: author)

Maragheh Museum

The museum was originally part of a library situated next to the mausoleum of the Iranian poet Owhadi Maragheh'ei. It has been transferred to a museum and opened to the public since 1976. The museum is divided into three sections namely Prehistoric Section, Parthian Section, and Sassanid Section. In the museum also numerous coins from the Islamic era, including Umavid, Abbasid, Safavid, and Qajar periods is being exposed to visitors.

Further reading

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10. http://www-groups.dcs.st-and.ac.uk/~history/Mathematicians/Copernicus.html
11. http://www.geocities.com/p_tarikhi/Maragheh.htm
12. http://www.jamejamshid.com/radkan.htm

Useful and relevant links

- http://www.maragheh.org
- http://www.azer.com/index.html
- http://www.azer.com/aiweb/categories/magazine/42_folder/42_articles/42_index.html
- http://en.wikipedia.org/wiki/Maragheh
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