

# Maragheh the biggest observatory of Middle Age

PARVIZ TARIKHI

Maragheh Observatory (Rasad Khaneh in local language, Azerbaijan) 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 Talebkhani Hills.

A considerable archaeological and historical studies as well as ground-work has been made on the remains of Maragheh Observatory. It is now revealed that the Observatory was a four-story circular stone building of 28 m of diameter constructed in a 540 to 135 m<sup>2</sup> circular 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 Zīj-i Ilkhani, an astronomical almanac; nowadays the reference meridian is the one which passes the Royal Greenwich Observatory in the United Kingdom.

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 centre of his huge state, which was known as Mongolian Ilkhanid Dynasty (Ilkhani means 'People's Khan' in Azerbaijani language). Maragheh, an ancient cultural centre became the first capital that later 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, Khan's advisor. Khajeh Nasir 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-tavarike, 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 destroyed other instruments for the Observatory, which was far more than a centre for astronomy. The library of the observatory contained 40,000 books on wide range of scientific topics in addition to astronomy and astrology, while work on mathematics and philosophy were vigorously followed there.

The idea of building Maragheh Observatory has its own specific story as was recorded by the well-known historian, Hajj 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 clamour, that's



Parviz Tarikhi.

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 Muhiy al-Din al-Maghribi, Mu'ayyid al-Din al-Urdi from Damascus, Qutb al-Din al-



Shirazi, and Hulaku's Chinese astronomer Foai Munji whose Chinese astronomical experience brought improvements to Ptolemaic system used by Khajeh Nasir.

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 Zīj-i Ilkhani, which clearly influenced Copernicus studies. The tables were published during the reign of Abaq 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 whom the Observatory had been active, however it is guessed to be active until about seven centuries ago. It was destroyed and turned into ruins because of frequent earthquakes and lack of state care and attention in different epochs. After suppressing the riot of Moker Tribe supported by the Ottoman Sultan Morad III, Shah Abbas the Great arranged for repairing the Observatory, however, because of the king's early death it was not commenced. The remains of the Observatory inspired Ulugh Beg 172 years later to construct his observa-

tory in Samarkand in 1428. Hulaku's elder brother, Khajeh Khan also constructed an observatory, the Gaocheng Astronomical Observatory, in China.

Maragheh Observatory had been the first largest centre in the world before the use of telescope in astronomical studies. Observatories in Samarkand and India had been modelled upon Maragheh Observatory. It 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. It is the mark of Khajeh Nasir's high conceive about the vitality of implementing such the endeavour 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 Mashhad, 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 contempo-



rary 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 actual 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 Antenna (Canon of Medicine), Euclid (Elements), Ptolemy (Almagest), Autolycus, Theodostus, 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'.

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 'Akhlagi Nasiri' dealt with ethics.

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'.

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 remains of the observatory. To save the remains of Maragheh observatory from further destruction, recently Iran's Cultural Heritage and Tourism Organisation (WHITTO) mounted a dome-framed shelter of brass over it that can be seen from remote distance. This structure protects the remains from different risks such as seasonal and climate changes. The dome is also planned to hold an exhibit of astronomical devices used at Maragheh Observatory. Research Institute of Astronomy and Astrophysics of Maragheh (RIAM) is the academic, international institution responsible for reviving the glory of Maragheh Observatory.

The writer is involved with Remote Sensing, Geographic Information Systems and Satellite-based Positioning. National Contact Points of the United Nations Economic and Social Commission for Asia and the Pacific (ESCAP) for Iran. He writes for The Independent.



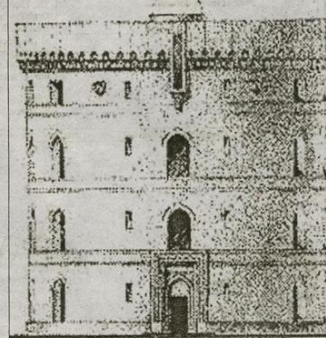
Dr. Mirhassan at the Sci

# A T W

SHAMUDD K P

Scientists are attracted by an awarding write across, across, they not interest with awards? A' canpali our con opment and pro Professor Dr Hasan, Chairi Council of Sci Research, ICS while he attende second natio Bangladesh Sci Forum. Recentl ers' body g p from the World Journalists.

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Maragheh Observatory.

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**Sony Tennis**  
Federer, Davydenko advance



## Motia Chowdhury hospitalised

Awami League presidium member Motia Chowdhury was admitted to Holy Family Red Crescent Hospital in the city after she felt chest pain yesterday morning.

Later she was transferred to Birken Hospital in the afternoon following advice of the Holy Family Red See Page 2 Col 5

## 'High-interest loans may drive inflation'

BINNEWS24.COM, DHAKA

Former caretaker government adviser Sheikh Abdul Momen said

# Gas supply to some industries to remain on hold 5 hrs a day

## Severe loadshedding hits city dwellers

SHAHNAJ BEGUM

In order to provide power plants with required quantity of fuel, energy ministry has asked Petrobangla to stop gas supply to re-rolling mills, lime and dyeing industries for five hours from 6 pm everyday.

Though the ministry last week decided to give priority to power plants than fertiliser factories and cut gas supply to those it did not work. To address the problem the energy ministry has now decided to stop

supply as it cannot increase power generation right at the moment. The energy ministry has also asked the Petrobangla to make a list of bulk consumers which are not producing essential commodities.

However, frequent power outage has gravely affected the life of the city dwellers for the last two days as power production has declined by 400 MW to 500 MW due to gas shortage. According to the power ministry sources, the country is now experiencing around 800 MW to 1000 MW

power shortage.

Frequent power failures just before the onset of summer season are also creating serious water crisis in the city for a long time. The city dwellers have to face loadshedding for 4 to 5 hours a day, specially in the old part of the metropolis. Tong and in the seven PBS under DESA's jurisdiction. Students are the worst sufferers. Small industries and hospitals have also been facing problems due to loadshedding every day.

The Power Development Board

(PDB) says it is producing 3400-3500 MW for the last two days which is 250MW to 350 MW less than the previous week. DESA authority says it gets 1100 MW to 1150 MW in day time and 1200 MW to 1250 MW at night against the demand of 1400MW and 11600 MW. Yesterday, DESA shed 170 MW in day time and 300 MW in evening although all re-rolling mills were closed in the evening. It could save a little through staggered supply during holidays. DESCO authority shed 103 MW in day time.

"We are unable to generate power as per our production capacity because Petrobangla is supplying us 600 mcf of gas against our required demand of 844 mcf per day, so we have to cut production at Ghorasal, Siddhirganj and Rozaan power plants", Dr. Fazlul Kabir Khan, secretary, power ministry, told The Independent yesterday.

He assured that the situation would improve within a couple of days with the supply of 600 MW to the See Page 2 Col 2

# Govt discusses ensuing talks with parties

STAFF REPORTER

The top rung of the caretaker government held an unscheduled meeting at Chief Adviser Dr. Fakhruddin Ahmed's office yesterday evening, sources said, adding that the meeting focused on some current issues including the ensuing dialogue, release of the detained Awami League President Sheikh Hasina on parole for treatment abroad and formation of the National Security Council.

The two-hour meeting started from 6 pm and was attended by the communications adviser, Major General (ret) Ghulam Quader, IGRD adviser Md Anwarul Iqbal, commerce and education adviser Hossain Zillur Rahman and law adviser Af Hassan Arif. It is learnt that the army chief General Moeen U Ahmed joined the meeting later. According to sources, the meeting was

held to devise government strategy for the upcoming dialogue with political parties.

It may be mentioned that four advisers sat informally at the office of the communications adviser on Monday. Earlier, the modalities of holding the proposed dialogue with the political parties was discussed at the advisory council meeting on Sunday when chief adviser Dr. Fakhruddin Ahmed briefed his colleagues on the issue.

In that meeting, the Chief Adviser assigned the four advisers to find out ways to start dialogue with the political parties. They were asked to place their views at the advisory council meeting to be held today, if the government can finalise the strategy on dialogue, it may invite the leaders of the political parties for talks by mid April, according to sources.

# ECs in tug of war with CEC over control of EC Sectt

## Letter sent to CA seeking remedy

UNB, DHAKA

The tug of war between the Chief Election Commissioner (CEC) and the two Election Commissioners

whose control the EC secretariat would actually remain.

The two Election Commissioners are expecting an answer in this regard from the CA's office within a

to the present government service rules, would be appointed by the government as per the requisition of the EC.

The gazette notification of the

# Hassina's medical check-up likely today

STAFF REPORTER

Detained former Prime Minister and Awami League president Sheikh Hasina is likely to be taken to the Square Hospital today for her routine medical check-up.

Talking to The Independent, Deputy Shamsul H Haider Siddiqui, Deputy

# Accomplice of top terror Imon killed in encounter

STAFF REPORTER

An accomplice of the top listed terrorist Imon was killed in a cross-fire with the Rapid Action Battalion (RAB) at Jigajola in the city in the early hours of yesterday.

The deceased was identified as Taj Mohammad Puir alias Killer

# Parties preparing for dialogue

STAFF REPORTER

Political parties are preparing themselves for the ensuing dialogue with the government, likely to be held in the second half of this month which, according to major political parties, would be the catalyst in the success of the election or otherwise election road-map or not.

As it is clear that a successful dialogue is prerequisite for holding parliamentary elections, political parties

Though the release of the detained party chiefs would be the main agenda of the two major parties, namely Awami League and the pro-Bhaleddi faction of BNP, other political parties have their own priorities that include declaration of the election date, withdrawal of ban on political activities. Lifting of the state of the emergency would be another key issue that all the political parties will demand.

BNP's reformist faction, Jatra party, Bhalasahans, Uddad, Puro-