

How Islam won, and lost, the lead in science

DENNIS OVERBYE

ASIR al-Din al-Tusi was still a young man when the Assassins made him an offer he couldn't refuse.

His hometown had been devastated by Mongol armies, and so, early in the 13th century, al-Tusi, a promising astronomer and philosopher, came to dwell in the legendary fortress city of Alamut in the mountains of northern Persia.

Although al-Tusi later said he had been held in Alamut against his will, the library there was renowned for its excellence, and al-Tusi thrived there, publishing works on astronomy, ethics, mathematics and philosophy that marked him as one of the great intellectuals of his age.

But when the armies of Halagu, the grandson of Genghis Khan, massed outside the city in 1256, al-Tusi had little trouble deciding where his loyalties lay. He joined Halagu and accompanied him to Baghdad, which fell in 1258.

Al-Tusi's deftness and ideological flexibility in pursuit of the resources to do science paid off. The road to modern astronomy, scholars say, leads through the work that he and his followers performed at Maragha and Alamut in the 13th and 14th centuries.

Commanded by the Koran to seek knowledge and read nature for signs of the Creator, and inspired by a treasure trove of ancient Greek learning, Muslims created a society that in the Middle Ages was the scientific centre of the world.

The Arabic language was synonymous with learning and science for 500 years, a golden age that can count among its precursors to modern universities, algebra, the names of the stars and even the notion of science as an empirical inquiry.

"Nothing in Europe could hold a candle to what was going on in the Islamic world until about 1600," said Dr. Jamil Ragep, a professor of the history of science at the University of Oklahoma.

It was the infusion of this knowledge into Western Europe, historians say, that fuelled the Renaissance and the scientific revolution.

"Civilisations don't just clash," said Dr. Abdelhamid Sabra, a retired professor of the history of Arabic science who taught at Harvard. "They can learn from each other. Islam is a good example of that."

The intellectual meeting of Arabia and Greece was one of the greatest events in history, he said. "Its scale and consequences are enormous, not just for Islam but for Europe and the world."

But historians say they still know very little about this golden age. Few of the major scientific works from that era have been translated from Arabic, and thousands of manuscripts have never even been read by modern scholars.

Islam's rich intellectual history, scholars are at pains and seem saddened and embarrassed to point out, belies the image cast by recent world events. Traditionally, Islam has encouraged science and learning. "There is no conflict between Islam and science," said Dr. Osman Bakar of the Centre for Muslim-

Christian Understanding at Georgetown.

"Knowledge is part of the creed," added Dr. Farouk El-Baz, a geologist at Boston University, who was science adviser to President Anwar el-Sadat of Egypt. "When you know more, you see more evidence of God."

"So the notion that modern Islamic science is now considered 'abysmal', as Abdus Salam, the first Muslim to win a Nobel Prize in Physics, once put it, haunts Eastern scholars.

"Muslims have a kind of nostalgia for the past, when they could contend that they were the dominant cultivators of science," Dr. Bakar said.

The relation between science and religion has generated much debate in the Islamic world, he and other scholars said. Some scientists and historians call for an "Islamic science" informed by spiritual values they say Western science ignores, but others argue that a religious conservatism in the East has dampened the sceptical spirit necessary for good science.

The Golden Age

When Muhammad's armies swept out from the Arabian penin-

Island, Kepler and Newton as a great mathematical scientist," said Dr. Lindberg.

The mathematician, astronomer and geographer al-Biruni, born in what is now part of Uzbekistan in 973, wrote some 146 works totalling 13,000 pages, including a vast sociological and geographical study of India.

Ibn Sina was a physician and philosopher born near Bukhara (now in Uzbekistan) in 981. He compiled a million-word medical encyclopedia, the Canons of Medicine, that was used as a textbook in parts of the West until the 17th century.

Scholars say science found such favour in medieval Islam for several reasons. Part of the allure was mystical; it was another way to experience the unity of creation that was the central message of Islam.

"Anyone who studies anatomy will increase his faith in the omnipotence and oneness of God the Almighty," goes a saying often attributed to Abul-Walid Muhammad Ibn Rushd, also known as Averroes, a 13th-century astronomer and philosopher.

Knocking on Heaven's Door

Another reason is that Islam is

similar to the Muslim astronomers in his early writings.

This has led some historians to suggest that there is a previously unknown link between Copernicus and the Islamic astronomers, even though neither Ibn al-Shatir's nor al-Tusi's work is known to have ever been translated into Latin, and therefore was presumably unknown in the West.

Dr. Owen Gingerich, an astronomer and historian of astronomy at Harvard, said he believed that Copernicus could have developed the ideas independently, but wrote in Scientific American that the whole idea of criticising Ptolemy and reforming his model was part of "the climate of opinion inherited by the Latin West from Islam".

The Decline of the East

Despite their awareness of Ptolemy's flaws, Islamic astronomers were a long way from throwing out his model: dismissing it would have required a philosophical as well as cosmological revolution. "In some ways it was beginning to happen," said Dr. Ragep of the University of Oklahoma. But the East had no need of heliocentric models of the universe, said Dr. King of Frankfurt. All motion being

relayed, he said, it was irrelevant for the purposes of Muslim rituals whether the sun went around the Earth or vice versa.

From the 10th to the 13th century Europeans, especially in Spain, were translating Arabic works into Hebrew and Latin "as fast as they could", said Dr. King. The result was a rebirth of learning that ultimately transformed Western civilisation.

Why didn't Eastern science go forward as well? "Nobody has answered that question satisfactorily," said Dr. Sabra of Harvard. Pressed, historians offer up a constellation of reasons. Among other things, the Islamic empire began to be whittled away in the 13th century by Crusaders from the West and Mongols from the East.

Christians re-conquered Spain and its magnificent libraries in Cordoba and Toledo, full of Arab learning. As a result, Islamic centres of learning began to lose touch with one another and with the West, leading to a gradual erosion in two of the main pillars of science - communication and financial support.

In the West, science was able to pay for itself in new technology like the steam engine and to attract financing from industry, but in the East it remained dependent on the patronage and curiosity of sultans and caliphs. Further, the Ottomans, who took over the Arabic lands in the 16th century, were builders and conquerors, not thinkers, said Dr. El-Baz of Boston University, and support waned.

Others argue, however, that Islamic science seems to decline only when viewed through Western, secular eyes. "It's possible to live without an industrial revolution if you have enough camels and food," Dr. King said.

"Why did Muslim science decline?" he said. "That's a very Western question. It flourished for a thousand years - no civilisation on Earth has flourished that long in that way."

Humiliating encounters with Western colonial powers in the 19th

In Memoriam

Fakhruddin Ahmed

ARSHAD-UZ ZAMAN

THE death of Fakhruddin Ahmed in the USA has left a big void among his many friends and admirers, and I count myself as one of them. This is a loss that will be very difficult to fill.

My first meeting with Fakhruddin Ahmed took place in New York in 1959. He joined the Pakistan Consulate General in New York where late Khwaja K M Kaiser was the Consul General. Fakhruddin Ahmed was a vice Consul General. Fakhruddin whom we all called Fakhr was lodged in the Penthouse of the Consulate General.

He was a bachelor and the Penthouse was an ideal bachelor's flat. I was Press Attache in the Pakistan Mission to the UN. The address of both the offices was 4 East 65th Street in Manhattan and they were joined together, with a large hall between them.

We were very young then and a natural friendship developed between us. There were not many Bengalis in Pakistan foreign missions and fewer in important positions. With Fakhr on one side and SAMS Kibria as a member of the Pakistan Mission on the other, we often talked about a future independent homeland of ours in East Pakistan.

I have spent many hours in the company of Fakhr, specially in his Penthouse. He was an expert cook and rather enjoyed cooking. I fondly recall those evenings, when evening breeze would envelop us at the Penthouse. Those were happy carefree days.

I left the Permanent Mission of Pakistan in 1964 and our paths did not meet right upto the birth of Bangladesh. We of course kept in contact with each other in our wandering around the world.

In 1972 when I was Chief of Protocol in our Foreign Ministry in Dhaka, Fakhr, who was posted in Islamabad, reached Dhaka taking the clandestine route via Kabul.

He was staying at the central circuit house. He joined then as Additional Foreign Secretary in the Ministry of Foreign Affairs. He has made a mention of this in his autobiography-

cal book Critical Times. Indeed this book is excellent reading to get a flavour of the times when our foreign policy was just evolving. It is an excellent autobiography of Fakhr. In this book Fakhr has bitterly criticised former dictator Hussein Muhammad Ershad on matters of



policy differences. Fakhr, who never bore grudge against any one, was too deeply hurt by the decision of H M Ershad and felt compelled to make a mention of it.

Thus Fakhr and I became colleagues in the same Ministry. I fondly recall my time with Fakhr. He was a wonderful friend and it was a joy to work with him. He was steady and completely unruffled, however strong the pressure. In those early days of our journey through an uncharted course, Fakhr's steady hand was of great importance in the execution of our foreign policy.

From the foreign ministry, I moved to Algiers in the middle of 1973 and opened our Mission. I then assumed the post of Ambassador. I received total support and the hand of friendship from Fakhr, who had become the Foreign Secretary. He steered our foreign policy with total integrity and patriotism.

I met Fakhr in London in the early eighties and he was our High Commissioner. Although he was grief stricken by his suffering wife, who was stricken with cancer, he maintained his equanimity and

extended a warm welcome to me. Shortly thereafter his wife passed away.

After retirement Fakhr returned to Dhaka and we often met. I was delighted that Fakhr broke away from his loneliness and married Lina. They were a very happy couple and traveled in many parts of the world. They had bought a flat in Toronto, Canada and were dividing time between Canada and Bangladesh. During their Dhaka visits they were most welcome guests in my Penthouse.

Meanwhile Fakhr continued to remain very active on a wide range of activities. He joined the BILJA as its head. He gave that institution excellent leadership. In 1990 he became the Foreign Affairs Adviser in the caretaker Administration led by Chief Justice Shahabuddin Ahmed. This was the administration which presided over the first holding of general elections which saw the assumption of power by Begum Khaleda Zia, leader of the Bangladesh Nationalist Party. Fakhr had become a poll watcher in many parts of the world. He then started the Fair Elections Monitoring Alliance (FEMA) and became its Chairman. That organisation has become famous and has been playing an ever growing role in the conduct of National elections in Bangladesh.

Fakhr became afflicted by cancer and for several years he fought bravely on. Finally he succumbed in the recent past. I am glad that the former Foreign Minister of Bangladesh and now President of the Republic Prof A Q M Badruddoza Chowdhury has named the meeting hall in the Foreign Ministry after Fakhruddin Ahmed.

While I offer my deepest condolences to Lina and all the children and all the members of the family, I pray Almighty for the safe repose of the soul of Fakhruddin Ahmed (Inna Lillah-i.....) It is a thousand pities that due to the delay caused by the Biman Fakhru's dead body could not be laid to rest on the soil of Bangladesh. He lies in eternal rest in Toronto. I am deeply saddened at the thought because Fakhr loved his Bangladesh dearly.

Arshad-uz Zaman is a former Ambassador.

Islam is one of the few religions in human history in which scientific procedures are necessary for religious ritual, Dr. David King, a historian of science at Johann Wolfgang Goethe University in Frankfurt, pointed out in his book "Astronomy in the Service of Islam," published in 1993...From the 10th to the 13th century Europeans, especially in Spain, were translating Arabic works into Hebrew and Latin "as fast as they could", said Dr. King. The result was a rebirth of learning that ultimately transformed Western civilisation.

...In the seventh and eighth centuries, annexing territory from Spain to Persia, they also annexed the works of Plato, Aristotle, Democritus, Pythagoras, Archimedes, Hippocrates and other Greek thinkers.

Hellenistic culture had been spread eastward by the armies of Alexander the Great and by religious minorities, including various Christian sects, according to Dr. David Lindberg, a medieval science historian at the University of Wisconsin.

The largely illiterate Muslim conquerors turned to the local intelligentsia to help them govern, Dr. Lindberg said. In the process, he said, they absorbed Greek learning that had yet to be transmitted to the West in a serious way, or even translated into Latin. "The West had a thin version of Greek knowledge," Dr. Lindberg said. "The East had it all."

In ninth-century Baghdad the Caliph Abu al-Abbas al-Mamun set up an institute, the House of Wisdom, to translate manuscripts. Among the first works rendered into Arabic was the Alexandrian astronomer Ptolemy's "Great Work," which described a universe in which the Sun, Moon, planets and stars revolved around Earth; Al-Magest, as the work was known to Arabic scholars, became the basis for cosmology for the next 500 years.

Jews, Christians and Muslims all participated in this flowering of science, art, medicine and philosophy, which endured for at least 500 years and spread from Spain to Persia. Its height, historians say, was in the 10th and 11th centuries when three great thinkers strode the East: Abu Ali al-Hasan ibn al-Haytham, also known as Alhazen; Abu Rayham Muhammad al-Biruni; and Abu Ali al-Hussein Ibn Sina, also known as Avicenna.

Al-Haytham, born in Iraq in 965, experimented with light and vision, laying the foundation for modern optics and for the notion that science should be based on experiment as well as on philosophical arguments.

"He ranks with Archimedes,

one of the few religions in human history in which scientific procedures are necessary for religious ritual, Dr. David King, a historian of science at Johann Wolfgang Goethe University in Frankfurt, pointed out in his book "Astronomy in the Service of Islam," published in 1993. Arabs had always been knowledgeable about the stars and used them to navigate the desert, but Islam raised the stakes for astronomy.

The requirement that Muslims face in the direction of Mecca when they pray, for example, required knowledge of the size and shape of the Earth. The best astronomical minds of the Muslim world tackled the job of producing tables or diagrams by which the qibla, or sacred directions, could be found from any point in the Islamic world. Their efforts rose to a precision far beyond the needs of the peasants who would use them, noted Dr. King.

Astronomers at the Samarkand observatory, which was founded about 1420 by the ruler Ulugh Beg, measured star positions to a fraction of a degree, said Dr. El-Baz.

Islamic astronomy reached its zenith, at least from the Western perspective, in the 13th and 14th centuries, when al-Tusi and his successors pushed against the limits of the Ptolemaic worldview that had ruled for a millennium.

According to the philosophers, celestial bodies were supposed to move in circles at uniform speeds. But the beauty of Ptolemy's attempt to explain the very un-uniform motions of planets and the Sun as seen from Earth was marred by corrections like orbits within orbits, known as epicycles, and geometrical modifications.

Al-Tusi found a way to restore most of the symmetry to Ptolemy's model by adding pairs of cleverly designed epicycles to each orbit. Following in al-Tusi's footsteps, the 14th-century astronomer Ala al-Din Abul-Hasan ibn al-Shatir had managed to go further and construct a completely symmetrical model.

Copernicus, who overturned the Ptolemaic universe in 1530 by proposing that the planets revolved around the Sun, expressed ideas

relative, he said, it was irrelevant for the purposes of Muslim rituals whether the sun went around the Earth or vice versa.

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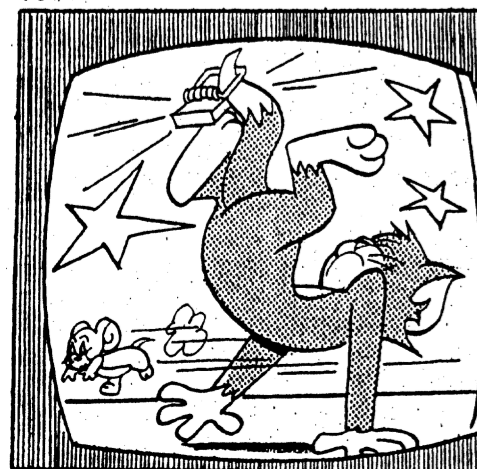
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