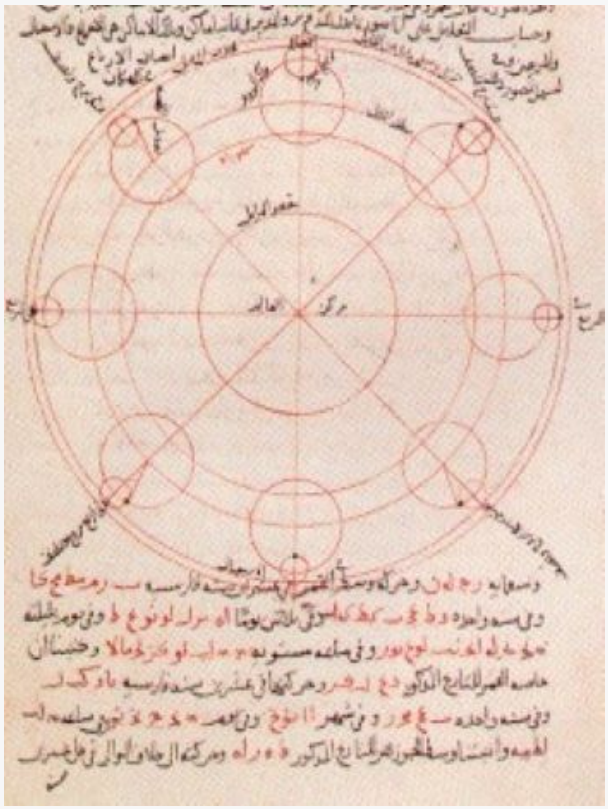
Study suggests Copernicus may have leaned on an ancient Muslim astronomer in developing his cosmological system

New research finds striking resemblance between Copernicus's heliocentric treatise and a Muslim scientist's cosmological model designed nearly 200 years prior.

SHARJAH, EMIRATE OF SHARJAH, UNITED ARAB EMIRATES, April 15, 2025 /EINPresswire.com/ -- New research has revealed that the cosmological model developed by Nicolaus Copernicus, the renowned European Renaissance polymath, bears striking resemblance to the one designed by an Arab astronomer nearly two centuries earlier.



Ibn-al-shatir's lunar model from which Copernicus is reported to have borrowed in composing his cosmological model. Credit: https://www.ccvalg.pt/astronomia/historia/idade_media.htm (Wikipedia).

Copernicus, a Polish astronomer who lived in the 16th century, is believed to be one of early European scientists to have put forward the theoretical model that the Sun was the center of the solar system, defying the church and the accepted wisdom that the Earth was the center of the universe.

Copernicus's model is called sun-centered or heliocentric. In it, he challenges centuries-old science based on the teachings of Aristotle and Ptolemy, who thought the Earth was at rest at the center of the universe with other planets, including the sun, in its orbit.

The research conducted at the University of Sharjah is a comparative and analytical study which examines in parallel the writings of Copernicus in correlation with the works of the 14th century Muslim astronomer Ibn al-Shatir.

A recently completed Ph.D. thesis posted to the Sharjah University Library website, the research textually and critically analyzes the contributions of the two scientists to see where they concur

or diverge in presenting their theories despite a historical gap of more than 200 years between them. (Original source URL: https://library.sharjah.ac.ae/record=b1762931)

Dr. Salama Al-Mansouri, the research's author, places Ibn al-Shatir's cosmological model at the forefront of astronomical achievements in the Islamic scientific tradition. "Ibn al-Shatir was the first astronomer to have successfully challenged the Ptolemaic cosmological system of planets revolving around Earth and corrected the theory's inaccuracies about two centuries before Copernicus," says Dr. Al-Mansouri.

Table of geographical longitude and latitude in (a later reworking of) the astronomical handbook of Ulugh Beg, reputed as the legendary Islamic astronomer. Credit: Leiden University Libraries.

An extract from Ibn al-Shatir's Nihayat al-sul fi tashih al-usul or "The Final Quest Concerning the Rectification of Principles" in which he expounds his cosmological model. Credit: The Leiden University Libraries.

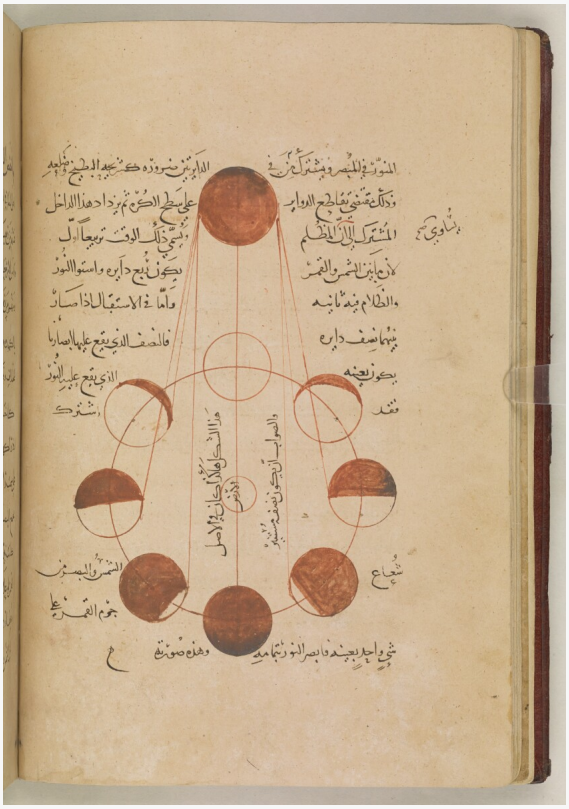
The fact that Copernicus borrows from works of scientists and astronomers who preceded him is not new. However, the study highlights the significant similarities between Copernicus and Ibn al-Shatir, an engineer, mathematician and astronomer who was the timekeeper for the Umayyad Mosque in Damascus, Syria.

Correlating the two cosmological models, the study suggests Copernicus was heavily influenced by Ibn al-Shatir's astronomy and his ideas that the Earth and other solar planets orbit the Sun.

"Ibn al-Shatir's astronomical manuscripts, particularly his work in Nihāyat al-Sul, demonstrate planetary models that predate and closely mirror those later proposed by Copernicus, indicating a shared mathematical lineage," says Mesut Idriz, University of Sharjah's professor of history and Islamic civilization and one of the study's supervisors.

Nihayat al-sul fi tashih al-usul or "The Final Quest Concerning the Rectification of Principles" is Ibn al-Shatir's most influential and important astronomical treatise in which, according to the

study, the Muslim scientist corrects and refines many of the Ptolemaic models of the Sun, Moon, and planets.



Kitab al-tafhom li-awaill sinaat al-tanjim or Comprehensive introduction to the principles of astrology, a question-and-answer format about astrologer: geometry, arithmetic, and number theory, by the famous Islamic astronomer Biruni. Reference: Or 8349.

Prof. Idriz acknowledges the complexity of studies based on “historical astronomical manuscripts” as they need to combine a “unique intersection of expertise—astronomy, manuscript studies, and historiography. Muslim manuscript-based research is an intricate process that requires fluency in Arabic and Persian, the medium of writing for Muslim scientists.”

Interpreting medieval astronomical manuscripts is not an easy job as it demands methodological precision, tracing textual transmission, comparing mathematical formulations, and evaluating observational data. To surmount such a sophisticated multidisciplinary approach, Dr. Salama sought advice and assistance from the community of academics at the Sharjah Academy for Astronomy, Space Sciences and Technology (SAASST), which has become a hub for renowned Arab and Muslim astronomers and scientists.

Dr. Salama conducts a critical textual analysis between Copernicus’s most famous work De revolutionibus orbium coelestium or On the Revolutions of the Celestial Spheres – a landmark in the history of science, which triggered the so-called Copernican Revolution – and the astronomical manuscripts of Ibn al-Shatir, particularly his Nihayat al-sul fi tashih al-usul.

The study reveals compelling correlations, underscoring the pivotal role of manuscript translation and transmission in the evolution of heliocentric theory and the assessment of the role the unraveling of Muslim manuscripts can play in rectifying historical inaccuracies about the history of science.

On the importance of the correlations between the work of Copernicus and that of Ibn al-Shatir, Mashhoor Al-Wardat, professor of astrophysics at SAASST, says, “The striking similarity between the planetary models developed by Ibn al-Shatir and Copernicus, particularly those concerning the orbits of Mercury and the Moon, provides clear evidence of Copernicus's reliance on Ibn al-Shatir's work ...This raises profound questions about the transmission of knowledge from Islamic civilization to Europe and about the roots of modern astronomy.”

Dr. Salama provides an overview of Arabic manuscripts and their Latin translations in European archives in Kraków in Poland, and the Vatican, where Copernicus made his most outstanding contribution to astronomy. She finds that Ibn al-Shatir's treatise Nihayat al-sul fi tashih al-usul was among the archives. She goes on, "Though in its original Arabic version, the manuscript could not have escaped the attention of a scholar like Copernicus."

The study provides no definitive proof that Copernicus had read Iban al-Shatir's works as there were no Latin translations of Ibn al-Shatir's writings accessible to the researcher. However, the research posits that the Polish astronomer most probably had access to Ibn al-Shatir's ideas through "intermediary channels" given the strong resemblance between their interpretations and mathematical calculations of planets orbiting the Sun.

The textual parallels between the two astronomers, according to the study, are most noticeable in "the identical calculations and results … imply(ing) that Copernicus may have adapted Ibn al-Shatir's techniques" in developing "his philosophical shift to heliocentrism" a model which the study admits was Copernicus's own invention.

However, the study sheds light on areas where Copernicus's theory draws directly on Ibn al-Shatir. It mentions the lunar model in which the Muslim astronomer uses epicycles to correct Ptolemy's exaggerated lunar distance variations.

"This is nearly identical to Copernicus's lunar model in De Revolutionibus," the study notes. "Both reduced the lunar distance fluctuation from Ptolemy's factor of two to a more accurate range, relying on similar geometric constructions.

"For Mercury and the inner planets, Copernicus's use of secondary epicycles and the Tusi-couple-like mechanism echoes Ibn al-Shatir's approach. Ibn al-Shatir's Mercury model, with its multiplication of epicycles to eliminate eccentrics, reappears in Copernicus's work."

Ibn al-Shatir is also celebrated for his Tusi-couple, a mathematical technique and an innovative mathematical device in which he employs additional epicycles to eliminate the equant—a problematic feature of Ptolemy's system.

The Tusi-couple derives its name from Nasir al-Din al-Tusi, a 13th century Muslim polymath whose writings show the most accurate tables in antiquity of planetary motions, an updated planetary model, as well as penetrating critiques of Ptolemaic astronomy.

Ibn al-Shatir's use of the Tusi-couple to simulate linear motion influenced Copernicus who produced similar adjustments, though Copernicus applied them within a heliocentric framework, the study notes.

Writes the study's author, "Both astronomers (Copernicus and Ibn al-Shatir) replaced Ptolemy's equant with additional circular motions, achieving uniform motion without an artificial reference

point.

“Ibn al-Shatir’s solar model, with a new eccentricity and epicycles yielding a maximum solar equation of 2;2,6°, parallels Copernicus’s solar calculations. This suggests Copernicus may have adopted Ibn al-Shatir’s numerical tables or methods, adapting them to his Sun-centered system.”

Asked whether she thinks Copernicus loaned at least parts of his theory from Ibn al-Shatir, Dr. Salama adds, “Our analysis reveals that Ibn al-Shatir’s treatise, though geocentric in intent, produced results so aligned with heliocentrism that Copernicus’s debt to him is undeniable—two centuries of separation could not erase this intellectual kinship.”

The research findings apparently seek to rectify what the author perceives as a historical oversight by Western scholars, who are frequently alleged in current Arab and Muslim science literature to have mostly Eurocentric tendencies, marginalizing contributions of Muslim astronomers like Ibn al-Shatir in favor of European figures like Copernicus.

The study is of significant implications to the history of science in the Middle Ages and the European Renaissance. By demonstrating parallels between Ibn al-Shatir’s and Copernicus’s work, the study challenges this Eurocentric narrative that the heliocentric revolution was a solely European achievement.

In the meantime, it underscores the Islamic Golden Age’s role in laying mathematical and observational foundations, prompting historians to reconsider the global flow of scientific knowledge.

The research goes as far as highlighting the need to update science curricula to reflect a more inclusive history, acknowledging contributions from non-Western scholars.

Of the significance of the study, Prof. Hamid al-Naimiy, a renowned astronomer and the research’s main supervisor, said, “This study is a clarion call to rewrite the history of astronomy, ensuring that the brilliance of Muslim scholars like Ibn al-Shatir stands alongside Copernicus in our collective narrative of scientific progress.”

Asked about his opinion of Ibn al-Shatir’s cosmological model, Prof al-Naimiy, who is also Sharjah University’s Chancellor and SAASST’s director, said the Muslim astronomer was a pioneer in Islamic scientific tradition and his treatise “shows that he dismantled the Ptolemaic model and corrected its flaws two centuries before Copernicus. This work emphasizes the significant contributions of our heritage to global astronomy.”

Says Dr. Salama, “Ibn al-Shatir’s empirical refinements within a geocentric framework, paralleled by Copernicus’s adaptation, illustrate how incremental improvements can precede paradigm shifts,” adding that her research “offers a model for modern science, where foundational work in

one context can catalyze breakthroughs in another.”

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