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ULUGH BEG'S PATRONAGE AND ASTRONOMICAL BOOK-MAKING

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Abstract: Among the numerous medieval Islamic astronomical works, star catalogues hold great value. One such catalogue, widely circulated in the Islamic world, is *Kitāb Ṣuwar al-Kawākib al-Sābiṭa* or *Kitāb Ṣuwar al-Kawākib* (*A Book of Fixed Stars*) by the Persian astronomer Abdurahman al-Sufi, written in 964 AD. It contains the coordinates of 1,017 stars arranged in 48 constellations. A distinctive feature of the very influential al-Sufi's book is that it includes images of the constellations with both Arabic and Persian names.

Of the surviving copies of *Kitāb Ṣuwar al-Kawākib*, a particularly valuable example is held in the Bibliothèque Nationale de Paris. This copy is likely the most colorful and richly produced of al-Sufi's work, featuring beautifully colored illustrations of the constellations.

This paper explores the question of whether the 'Paris' copy of al-Sufi's book once belonged to the Ulugh Beg library, and provides new evidence supporting this claim.

Keywords: Ulugh Beg; *Kitāb Ṣuwar al-Kawākib* (*A Book of Fixed Stars*); Paris copy.

1 INTRODUCTION

The compilation of star catalogues with images of constellations has been a distinct area of astronomy since ancient times. In these catalogues or atlases, stars were organized into constellations, with their lists provided constellation by constellation for convenience. The names of constellations from ancient Greek mythology have survived to this day. Some star and constellation names were modified or added by Islamic astronomers (the term 'Arab astronomers' has persisted in scholarly discourse, though many Islamic astronomers were not ethnic Arabs! They wrote their works in Arabic—the common language of science at that time). Among the Islamic star catalogues that became widely used is *Kitāb Ṣuwar al-Kawākib* (*A Book of Fixed Stars*), written by the Persian astronomer Abdurahman al-Sufi in 964 CE (Al-Sufi, 1437).

A Book of Fixed Stars offers Islamic images of the constellations, along with their Arabic and Persian names, which adds significant cultural and historical value to al-Sufi's work.

2 *A BOOK OF FIXED STARS* BY AL-SUFI

The work of al-Sufi, *Kitāb Ṣuwar al-Kawākib*, became so famous that its significance endured for centuries after it was written. Today, about a hundred copies of this work are preserved in library collections across the Middle East, Europe, and North America (Hafez et al., 2010). The oldest surviving manuscript appears to be the one housed in the Doha Museum, dated to 1125 CE (Dolan, 2017).

A number of studies have been dedicated to analyzing the work of al-Sufi. Among the most recent studies, notable contributions include those by Hafez (2010), Hafez et al. (2011; 2015a; 2015b) and al-ʿUğājī (2020).

In the introduction to his work, al-Sufi dedicates it to his patron, the Buyid monarch ʿAdud al-Dawla, who ruled from 949 to 983 (Bürgel and Mottahedeh,1988). Al-Sufi worked at the court of ʿAdud al-Dawla, particularly at the observatory that the monarch had built in Isfahan on his orders. The monarch, very proud of his Iranian heritage, influenced the naming of constellations, changing their names from Arabic to Persian. However, the work of al-Sufi itself was written in Arabic, the common language of science at that time (Donohue, 2003). In the introduction, al-Sufi notes that he drew upon various sources, including pre-

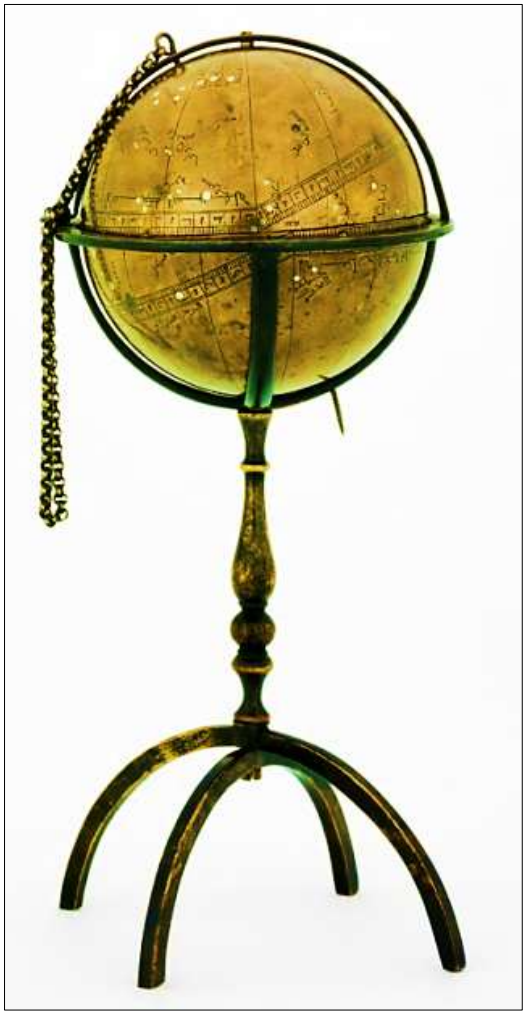

Figure 1: Heavenly globe made by Muhammad ibn Jaʿfar ibn Umar al-Asturlabi, dated AH 834 (AD 1430–1431). Brass, engraved and inlaid with silver. Diameter: 10.5 cm. (London: courtesy, the Trustees of the British Museum).

Figure 2: The constellation Pegasus (*al-Faras al-ʻAzam*) from *Kitāb Ṣuwar al-Kawākib* by al-Sufi (Bibliothèque Nationale de Paris, MS 5036).

Islamic Arabic works, though unfortunately these works have not survived (Savage-Smith, 2013).

The book contains a catalog of 1,017 stars, circulated across 48 constellations. Following the tradition established by Ptolemy in his *Almagest*, the stars in al-Sufi's book are presented constellation by constellation. For each constellation, al-Sufi provides two illustrations: one of how the constellation appears when observed from Earth (i.e., from within the sphere of stars) and another showing the constellation from outside the celestial sphere. The latter image was intended for celestial globe makers. Unfortunately, only a few Islamic celestial globes have survived. One notable example is the globe made by Muhammad ibn Jaʿfar ibn Umar al-Asturlabi, dated to AH 834 (AD 1430)—see Figure 1. The constellations on this globe were plotted in accordance with the images in the *Kitāb Ṣuwar al-Kawākib* (Savage-Smith, 1985). Some sources note that this globe belonged to Ulugh Beg (ibid.).

3 A COPY OF *A BOOK OF FIXED STARS* CREATED FOR THE LIBRARY OF ULUGH BEG

Among the surviving copies of *Kitāb Ṣuwar al-Kawākib*, a particularly valuable example is held at the Bibliothèque Nationale de Paris. This copy is likely the most colorful and richly produced (on high-quality paper) of al-Sufi's work, featuring beautifully colored illustrations of the constellations. To illustrate this, Figure 2 shows the constellation Pegasus. Al-Sufi referred to it as *al-Faras al-ʻAzam* (the Big Horse). This suggests that the art of creating illustrated books in fourteenth to fifteenth century Central Asia reached its pinnacle during this period.

Another notable feature of this copy of the book is that it was most likely commissioned by Ulugh Beg himself.

This particular copy of al-Sufi's *Kitāb Ṣuwar al-Kawākib* has been the subject of detailed studies by experts in oriental miniatures. The results of these studies are summarized in a comprehensive article by Ivanov (1977). Based on the style of the miniatures (specifically the constellation images), the time of its creation (with many unclear details), and the application of the ex libris, Ivanov (ibid.) concludes that experts cannot definitively determine which workshop in Herat or Samarkand produced the 'Parisian' copy of al-Sufi's *The Book of Fixed Stars*. The importance of these findings lies in the fact that, if the copy was made in Herat, it would likely have no connection to Ulugh Beg, and his autograph may have been added after he captured Herat fol-

lowing the death of his father Shahrukh in 1448 (ibid.).

However, several details suggest that this copy was indeed commissioned directly by Ulugh Beg.

First, let us examine the inscriptions on the title page of the 'Paris' copy. Figure 3, with the arrow, highlights the autograph of Ulugh Beg.

The circular inscription at the center translates as follows:

> This book belongs to the library of the great sultan, supreme ruler, king of the Turks, Arabs, and Persians, the shadow of Allah on Earth, Mirza Ulugh Beg. His justice stretches from the south to the north. He offers the fruits of his wisdom to the people of the world, and may Allah make his reign eternal.

However, the round seal on the left reads: "Allah is sufficient for me, the guardian of kindness, and I am His servant, Muhammad Sultan." It should be noted that this seal has led to doubts regarding the ownership of the copy by Ulugh Beg, as Muhammad Sultan (1418–1452), the ruler of Central Iran and Fars, was Ulugh Beg's nephew and he could also have been the customer for this book. It can be assumed, as Ivanov (1977) suggests, that Ulugh Beg's autograph was added later. However, the symmetrical text at the center of the title page strongly indicates that this book belonged to Ulugh Beg's library. Its location in the middle of the page and not on the side indicates that it was written during the production of the book. Unfortunately, no information has been found in the sources regarding how the book made its way to him in Central Iran, moreover, we have not found any facts about Muhammad Sultan's interest in astronomy.

There is another important piece of evidence supporting the idea that the book belonged to Ulugh Beg. Figure 4a shows an image of the constellation Cepheus from the Paris copy of the book. As is known, Cepheus is a mythical Ethiopian King, the husband of Cassiopeia, and the father of Andromeda.

On Arabic maps, the constellation is named *Al-Multagib*, which means 'fiery' or 'ardent'. In al-Sufi's book, this constellation is referred to as *Kai-Kaus*, a mythological shah of Greater Iran and a character in the *Shāhnāmeh* (Firdawsī, 1832). It is important to remember that al-Sufi wrote his book at the order of ʿAḍud al-Dawla, who was proud of his Iranian heritage and culture (Donohue, 2003). The miniaturist likely considered it necessary to depict the ruler in this constellation, most probably Ulugh Beg, who commissioned the book. In any case, it would have been appropriate for Ulugh Beg to be associated with this 'royal' constellation.

Regarding the portrait similarity, Figure 4b shows the miniature titled *Ulugh Beg with Ladies of His Harem and Retainers* from the Freer Gallery of Art Collection. This miniature, dated 1442, was created during Ulugh Beg's lifetime and likely depicts the ruler himself.

A stronger argument for the portrait resemblance between Ulugh Beg and the *Kai-Kaus* is the fact that, despite uncertainties about the

Figure 3: The title page of *Kitāb Ṣuwar al-Kawākib* by al-Sufi (Bibliothèque Nationale de Paris, MS 5036). The arrow, highlights the autograph of Ulugh Beg, which reads: "Among the servants of Allah, the one who needs Him the most is Ulugh Beg."

place of production, it is certain that Ulugh Beg held both these miniatures in his hands and saw his 'portraits'.

Another noteworthy detail is the absence of the traditional glorification (praise) of the patron, ʿAḍud al-Dawla, in the introduction of the book. Since this book (and its copies) were ordered by Ulugh Beg, it would have been deemed inappropriate to mention another ruler's name.

4 CONCLUDING REMARKS

It is well known that Ulugh Beg was not only an outstanding scientist but also a patron of science and the founder of madrasahs—Medieval higher schools where astronomy, mathe-

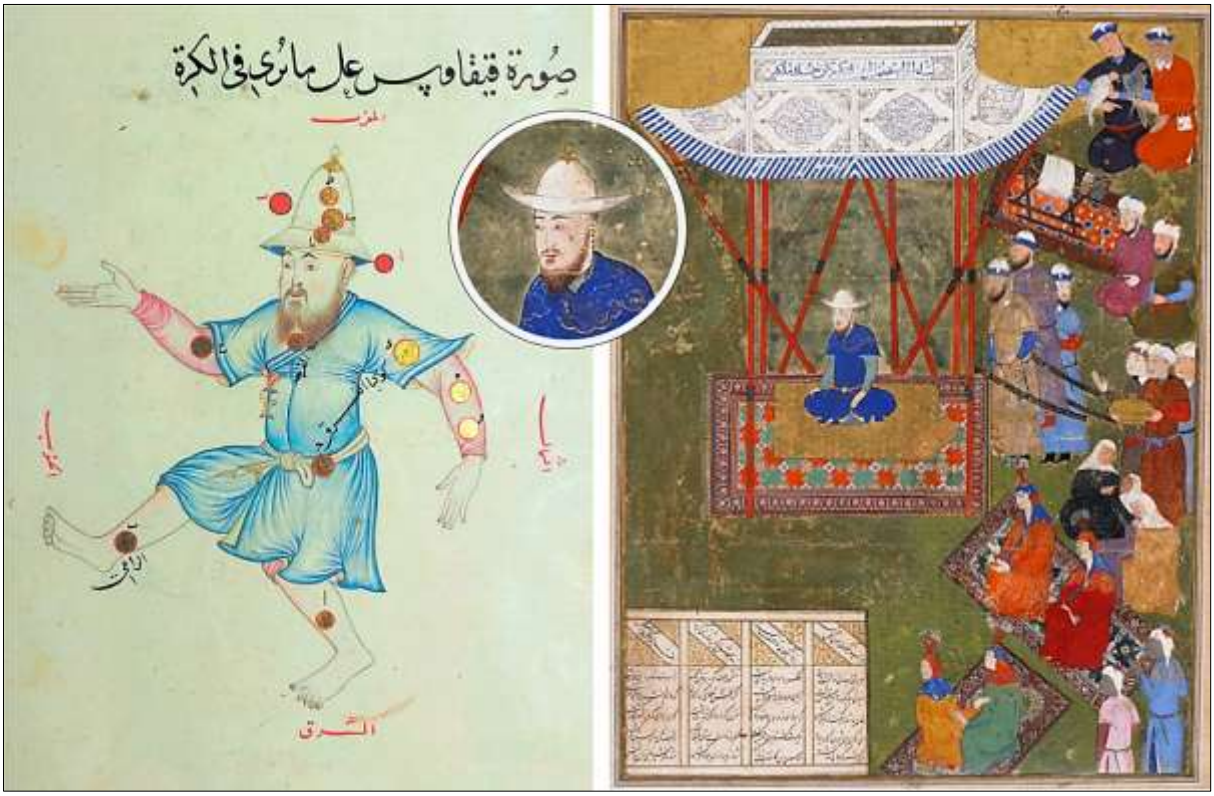

Figure 4a: Constellation Cepheus (*Kai-Kaus*) from *Kitāb Ṣuwar al-Kawākib* by al-Sufi (Bibliothèque Nationale de Paris, MS 5036). Figure 4b: Miniature titled "Ulugh Beg with ladies of his harem and retainers" dated 1442 (National Museum of Asian Art, Freer Gallery of Art Collection, Washington).

matics and other subjects were prioritized (Akhmedov, 2022). He supported poets, philosophers, and artisans who produced art objects. Much less is known about his efforts in creating *kitābhāne*—book houses, where various books were produced, including those for his personal library. Among the books, which are masterpieces of printing and miniature art, a copy of *Kitāb Ṣuwar al-Kawākib* (*A Book of Fixed Stars*) by his predecessor Abdurrahman al-Sufi deserves special attention. Ulugh Beg actively used this book and ordered a luxurious copy of it from the *kitābhāne* for his library. This copy has survived to this day and stands as an excellent example of the symbiosis of astronomy and art.

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6 REFERENCES

Akhmedov, A.A., 1994. *Ulugbek Muhammad Taragay: "Zij" Noviye Guraganovy Astronomicheskiye Tablitsy.* Tashkent, FAN, Beruni Institute of Oriental Studies (in Russian).

Akhmedov, A.A., 2022. *Muhammad Taragai Ulugh Beg: Zij. The New Guragani Astronomical Tables.* Translation into English, introductory article, commentaries, and indices by Professor A.A. Akhmedov. Tashkent, Beruni Institute of Oriental Studies, Samarkand International University of Technology.

Al-ʿUğājī, Ḫālid bin ʿAbd Allāh, 2020. *Taḥqyq: Al-Ṣūfī al-Ḥusayn ʿAbd al-Raḥman bin ʿOmar al-Rāzī. Kitāb Ṣuvar al-Kawākib* (Arabic). Al-Rīyāḍ, King Fahad National Library publications (in Arabic).

Al-Sufi, Abdurahman, 1437. *Kitāb Suwar al-Kawākib by Al-Sufi*. Bibliothèque Nationale de France, MS. Arabe 5036. Full manuscript available at: http://gallica.bnf.fr/ark:/12148/btv1b60006156.image.f1.langFR (in Arabic).

Bürgel, Ch., and Mottahedeh, R., 1988. ʿAžod-al-dawla, Abū Šojāʿ Fannā Ḵosrow. In *Encyclopaedia Iranica*, Volume III, Fasc. 3. Columbia University, Ehsan Yarshater Center for Iranian Studies. Pp. 265–269.

Dolan, M., 2017. *Astronomical Knowledge Transmission Through Illustrated Aratea Manuscripts*. Cham (Switzerland), Springer. Pp. 178–179. ISBN: 978-3-319-56784-6.

Donohue, J.J., 2003. *The Buwayhid Dynasty in Iraq 334 H./945 to 403 H./1012: Shaping Institutions for the Future.* Leiden, Brill. ISBN: 90-04-12860-3.

Firdawsī, 1832. *The Sháh Námeh of the Persian Poet Firdausí.* Translated by James Atkinson. Printed for the Oriental Translation Fund of Great Britain and Ireland.
Hafez, I., 2010. *Abd al-Rahman al-Sufi and his Book of the Fixed Stars: A Journey of Re-Discovery.* PhD thesis, Centre for Astronomy, James Cook University, Townsville, Queensland, Australia.
Hafez, I., Stephenson, F.R., and Orchiston, W., 2011. ʿAbd al-Raḥmān al-Ṣūfī and his *Book of the Fixed Stars*: a journey of re-discovery. In Orchiston, W., Nakamura, T., and Strom, R. (eds.). *Highlighting the History of Astronomy in the Asia-Pacific Region: Proceedings of the ICOA-6 Conference.* New York, Springer. Pp. 121–138. ISBN: 978-1-4419-8161-5.
Hafez, I., Stephenson, F.R., and Orchiston, W., 2015a. ʿAbd al-Raḥmān al-Ṣūfī's three-step magnitude system. In Orchiston, W., Green, D.A., and Strom, R. (eds.). *New Insights From Recent Studies in Historical Astronomy: Following in the Footsteps of F. Richard Stephenson.* New York, Springer. Pp. 169–177.
Hafez, I., Stephenson, F.R., and Orchiston, W., 2015b. The investigation of stars, star clusters and nebulae in ʿAbd al-Raḥmān al-Ṣūfī's *Book of the Fixed Stars*. In Orchiston, W., Green, D.A., and Strom, R. (eds.). *New Insights From Recent Studies in Historical Astronomy: Following in the Footsteps of F. Richard Stephenson.* New York, Springer. Pp. 143–168.
Ivanov, A.A., 1977. Istoriya Izucheniya Maverannakhrskoi Shkoly Miniatyur. In Gafurov, B.G., and Litvinsky, B.A. (eds.), *Srednyaya Aziya v Drevnosti i Srednevekov'ye*. Volume 1. Moscow, Nauka publishers. Pp. 144–159 (in Russian).
Kennedy, E.S., 1956. A survey of Islamic astronomical tables. *Transactions of the American Philosophical Society*, New Series, 46(2), 123–177.
Savage-Smith, E., 1985. *Islamicate Celestial Globes: Their History, Construction and Use.* Washington, Smithsonian Studies in History and Technology, No. 46, 1–354.
Savage-Smith, E., 2013. The most authoritative copy of ʿAbd Al-Rahman Al-Sufi's tenth-century Guide to the Constellations. In Blair, S., and Bloom, J. (eds.), *God Is Beautiful and Loves Beauty: The Object in Islamic Art and Culture*. New Haven, Yale University Press. Pp. 122–155.

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He is Professor of the National University of Uzbekistan and Samarkand State University, teaching astrophysics courses in the Bachelors and Masters degrees. Over the past four decades Professor Ehgamberdiev has supervised more than 25 MAstron, 20 PhD and 2 DSc astrophysics theses. In 2008 he was awarded the 'Medal of Glory' of the Republic of Uzbekistan, plus 'Chevalier dans l'Ordre des Palmes académiques' (2014) of the Government of France, 'La médaille de l'ADIONS' (2015) of the Cote d'Azur observatory, and 'Honored Scientist of the Republic of Uzbekistan' (2022).

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His primary research focuses on the history and source studies of the peoples of Central Asia. He has made significant contributions to the academic circulation of historical sources and the cataloging of Eastern manuscripts. Notably, he translated the tenth-century travels of the geographer al-Istakhri's *Kitāb al-Masālik wa al-Mamālik* into Uzbek, based on 19 versions in Arabic and Persian, using a critical text approach. He has also actively contributed to preparing a catalog of philosophical and philological manuscripts at the Abu Rayhon Beruni Institute of Oriental Studies for publication.

Dr. Khudayberganov is the author of more than 50 scientific works. He is deeply involved in advancing the field of source studies and promoting it among young people. Additionally, he has taught specialized courses in source studies at the Tashkent State Institute of Oriental Studies for several years. He is also a member of the UNESCO National Committee of Uzbekistan for the *Memory of the World* program.

Dr. Sabit Ilyasov was born in 1956 in the Tashkent region of Uzbekistan. He is a leading scientist in the fields of astrophysics and atmospheric physics. Dr. Ilyasov graduated with Honors in 1982 from the Nizami Tashkent State Pedagogical Institute, specializing in Physics and Astronomy. In 2011, he earned a Doctorate in Physics and Mathematics.

He has worked at the Ulugh Beg Astronomical Institute of the Uzbek Academy of Sciences for over 40 years, holding various positions, including Deputy Director for Scientific Work. Dr. Ilyasov is renowned for his research on astroclimate and the atmospheric conditions necessary for observing rare astrophysical objects. His significant contributions include the discovery of Kumbel Mountain, a site in Uzbekistan dedicated to solar research.

Dr. Ilyasov has published more than 80 scientific articles, many of which have appeared in prestigious international journals. He has participated in numerous scientific conferences worldwide and has fostered several international collaborations.

An active educator, Dr. Ilyasov has taught at multiple universities and supervised many graduate theses. He has also contributed to the popularization of astronomy through articles and educational films. Dr. Ilyasov is a member of the PhD councils at both the Ulugh Beg Astronomical Institute of the Uzbek Academy of Sciences and the National University of Uzbekistan.

Dr. Qudratillo Yuldoshev was born in 1985 in Andijan, Uzbekistan. He holds a BSc and MSc degree from Andijan State University and a PhD from the Ulugh Beg Astronomical Institute of the Uzbek Academy of Sciences. Currently, he works as a senior researcher at the Ulugh Beg Astronomical Institute.

Dr. Yuldoshev has made significant contributions to cataloging and analyzing astronomical data. He has worked on the "Photographic Sky Survey" project, processing and analyzing images, and collaborating with the Shanghai Astronomical Observatory to digitize archival data. His efforts contributed to the creation of a star and galaxy catalog now included in global astronomical databases.

In addition to his scientific work, Dr. Yuldoshev has actively promoted astronomy among young scientists and students. He has participated in both national and international scientific conferences and has contributed over 70 research papers and theses to various journals and proceedings.