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Solar Eclipses in Medieval Islamic Civilization: A Note on Cultural and Social Aspects[1]

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A total solar eclipse is one of the most beautiful celestial phenomena visible to the naked eye. It can inspire awe, and solar eclipses have sometimes been interpreted as omens. Despite their rarity, solar eclipses have had a large impact on society and sometimes they could change the course of history. In the Middle East the best-known solar eclipse affecting a historical event occurred during a war between the Lydians and the Medes on 28 May 585 B.C.[2] Darkness fell in the middle of battle, so both sides became fearful and eager to make peace. The Greek historian Herodotus (I, 168) tells us that the year of the eclipse had been predicted by Thales of Milete. But the claim is vague and the contribution of Thales doubtful in the opinion of modern historians of astronomy; no theoretical framework for the prediction of such eclipses seems to have existed at the time (see Panchenko, 275).

In ancient times, the births and deaths of leaders or dignitaries were often supposed to be associated with celestial omens. However, Islamic theology does not accept that eclipses are indications of events on earth.[3] The Prophet's infant son, Ibrāhīm, died on 29 Shawwal 10 A.H./27January 632 A.D. The event was dated precisely because historians mention that the sun was eclipsed on that day. Some

1. This article is an English translation of a part of my Ph.D. dissertation titled "Les éclipse solaires dans l'astronomie islamique" at the University of Lille 1 (France), under supervision of Prof. Ahmed Djebbar.

2. There is a wide agreement about the mentioned date of this eclipse. This date is in agreement with historical and astronomical facts, but it has been proposed various other dates (see Panchenko, 275- 288; Stephenson and Fatoohi, 279-282).

3. Schaefer has discussed that the year of the prophet Muhammad's birth is memorable because of a solar eclipse that occurred on 24 Nov. 569 A.D. Indeed, I could not confirm this claim after searching historical sources relevant to this statement (see Schaefer, 39).

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Meccans claimed that the eclipse was an omen sent by God, indicating Ibrāhīm's death. The Prophet quickly rejected this claim, declaring "The sun and moon are signs of God and do not eclipse for the death or birth of any person", then he prayed with his fellow Muslims because of the eclipse (al-Yaʿḳūbī, II, 96; al-Maḳdisī, III(5), 17; Ibn Kathīr, III(5), 27)[1]. Islamic theologians probably have used this statement to support the rejection of astrology (see Hādjī Khalīfa, I, 22; II, 1930-1931). In Islamic culture, solar and lunar eclipses are associated with a specific prayer which is called the "prayer of eclipse" (*ṣalāt al-kusūf*). It is a necessity for every Muslim to praise God during an eclipse, because the eclipse is a sign from God. In medieval Islamic society, people gathered in the great mosque and even small mosques of cities to perform this payer in a large group (see al-ʿAsḳalānī, VII, 347; Ibn Ṭūlūn, I, 375; Ḳāḍī Shuhba, I, 165; Ibn Iyās, II, 44). During partial solar eclipses, where the darkening of the sky was not so visible, people seem not to have gathered to perform praying because of the eclipse (see al-ʿAsḳalānī, IV, 8-9; al-Maḳrīzī, VII, 384).

The second solar eclipse affecting Islamic history occurred 39 years after the death of the Prophet, in 661 A.D., when Muʿāwiya became leader of the empire after a revolt against ʿAlī ibn Abī Ṭālib. Muʿāwiya decided to transfer the Prophet's pulpit from Medina to his capital in Damascus, Syria. But as his men were removing the pulpit, a solar eclipse occurred, and the sky darkened in such a way that stars could be seen. This darkening was taken as a sign of divine displeasure, and the pulpit was duly returned to its place. This event was regarded as a symbol of Muʿāwiya's failure (al-Ṭabarī, III, 207; al-Masʿūdī, III, 5; Ibn al-Djawzī, V, 227, 228; Ibn al-Athīr, III, 319).[2]

It seems to have been a matter of controversy among theologians

1. Ibn Kathīr erroneously dated Ibrāhīm's death on 10 Rabīʿ al-awwal 10 A.H. It is clear that solar eclipses occur at the end of lunar months. Further, modern computations show that the only solar eclipse that was visible from Mecca in 10 A.H occurred on 29 Shawwāl.

2. This eclipsed occurred on 29 Dhu al-ḳaʿda 51 A.H/ 7 Dec. 671, not the year 50 A.H. which historians commonly mention. It is important to consider that historians tell us, this event occurred when Muʿāwiya wanted to perform *Ḥajj* (pilgrimage to Mecca), so the computed date being in agreement with this matter. Further this is the only total solar eclipse could be seen greatly in Medina for a long period before and after 51 A.H.

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whether computations of eclipses could be harmonized with the omnipotence of God. Some theologians held the view that eclipses were God's affairs, in which astronomers should not intervene, so eclipse computations should not be made. Other theologians with scientific interests argued that eclipses occur by God's will and that astronomers have no effect on their occurrence; they can only predict them by rules derived from geometry and arithmetic (see al-Ghazzālī, 80; Hādjī Khalīfa, II, 1930-1931; Ibn 'Arabī, VII, 313-314). Despite the clear statement of the Prophet on the irrelevancy of eclipses with the daily life of people, many astrological books in the Islamic period discussed astrological rules (*aḥkām*) for the supposed effects of solar eclipses (see Ibn Hibintā, II, 36-53; al-Bīrūnī, 503-505, 513; Abū Naṣr Ḳumī, 181).

Sometimes an eclipse was regarded as foretelling the death of a ruler, or as a sign of impending disaster or rebellion (see Ibn 'Idhārī, III, 10; al-Maḳrīzī, VII, 384). Ibn Iyās (III, 238), who lived in Cairo, reports that people were predicting the death of the Sultan after a lunar eclipse in Ṣafar 892 A.H. However, the Sultan lived on happily and stayed in power for a long time.

We learn from some Arabic chronicles, that ordinary people were informed by astronomers of the predictions of the circumstances (times and magnitudes) of future eclipses. Al-Maḳrīzī (VII, 226) and al-'Asḳalānī (VIII, 235), who both lived in Cairo, report a solar eclipse in 834 A.H/1431 A.D as follows respectively[1]:

> "In Djumādī al-Ukhrā, the astronomer warned that the sun would be eclipsed. They were calling in Cairo that people should fast and do good deeds. However, the eclipse did not occur and those who gave the warnings were denounced. Then news arrived from al-Andalus of the occurrence of an eclipse there, covering all the sun's body except one-eighth of it. That was after midday on the 28th of the month."
>
> "In Djumādī al-Ūlā it was known that the calendar experts agreed that the sun was to be eclipsed on the 28th of

1. The English translation of the reports mentioned in this article, are from Said et al, with some small modifications.

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> the month after the *Zawāl* (i.e. after the sun had crossed the meridian). The Sultan and the people were prepared for it and were watching the sun until it set, but no change in it occurred at all."

These two reports refer to the same eclipse, which occurred in Djumādī al-Ūlā rather than the following month Djumādī al-Ukhrā. Modern computations show this solar eclipse was visible from Cairo in the late afternoon, and that a maximum of 0.43 of the solar diameter was eclipsed.[1] The failure of so many observers to notice the eclipse is indeed surprising, since no mention is made of unfavorable weather.[2] In Andalus, the eclipse was probably observed in the region of Granada, where the eclipse magnitude reached 0.90 (Said et al, 58; Stephenson, 446).

Because a solar or lunar eclipse is an event which does not last long, a correct prediction requires very precise astronomical tables, and small inaccuracies in the tables manifest themselves in incorrect predictions. Thus, there was a constant debate in scientific circles about the (lack of) accuracy of astronomical tables used for prediction of eclipses. Eclipse prediction was a motivation for the compilation of new *zīj*es by later astronomers. In his *Zīj al-Kabīr*, Ibn Yūnus (see Caussin, 135-149, 167-181, 217-233) discusses a great number of solar and lunar eclipses from previous astronomers. In some cases, he reports the numerical values of the differences (in time and magnitude) between the actual observation of the eclipse by astronomers and the prediction of the eclipse made by the same astronomers on the basis of *zīj*es. Of course, the calculation of the time of a solar eclipse might also be affected by simple (and avoidable) computation errors. Ḳāḍī Shuhba (I, 165) discusses a solar eclipse in Damascus, which occurred in 787 A.H/ 1386 A.D, and for which the calculation differed from the actual occurrence:

> "In the month Dhu al-ḳa'da, the sun was eclipsed after it reached the meridian and judge (*Ḳāḍī*) Burhān al-Dīn ibn

1. The calculations show that the maximum of solar eclipse at Cairo occurred when the sun was 7º above the western horizon.

2. Since there is no mention of the specific place of observation, they would observe it from a place far from Cairo, where the solar eclipse would be covered less than 0.20. In such conditions the darkness of solar eclipse was difficult to be seen with naked eye.

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> Djamā'a led the eclipse prayer and gave a speech (*Khuṭba*). At the beginning of the day his deputy had already led the eclipse prayer in the mosque and given a speech. Thus it was said that the eclipse occurred twice in one day. The first was according to calculation and the sky was then cloudy; a mistake had been made in the calculation."

In medieval Islamic astronomy, errors in eclipse prediction by competent astronomers usually did not exceed one hour, and many predictions were made with an accuracy of half an hour or even 20 minutes. This can be shown by analysis of solar eclipse tables from the Islamic period by modern astronomical methods and parameters and computer calculations (Steele, 121-124). But estimating the zone of totality for a solar eclipse was problematic, even for the best astronomers of the medieval Islamic period. An error equivalent to one digit of magnitude of solar eclipse [=1/12 of the apparent diameter of the sun] can move the predicted location of the zone of totality by as much as 500 km away from the correct place.[1] This should be kept in mind in judging the solar eclipse predictions of the medieval Islamic astronomer.

Another interesting report of a solar eclipse in 453 A.H/1061 A.D., is from Ibn al-Djawzī (XVI, 68-69). He wrote a century after the eclipse and his report is clearly based on an eyewitness description (Stephenson, 439). This report does not only show the role of astronomers in society, but also the problem of estimating the zone of totality:

> "On Wednesday, when two nights remained to the completion of (the month of) Djumādī al-Ūlā, two hours after daybreak, the sun was eclipsed totally. There was darkness in the world (!) and the birds fell whilst flying. The astronomers had claimed that one-sixth of the sun should have remained (visible) but nothing of it remained (i.e., the eclipse was total). The sun reappeared after four hours and a

1. The zone in which a solar eclipse can be seen total is narrow and typically it is about 250km. in width. Of course it depends on several parameters such as: the observer's position in relation to the global path of solar eclipse and distance of the moon and sun from the earth.

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> fraction (of an hour).[1] In places other than Baghdad and the province, the sun was not completely eclipsed."

Despite the fact that the astronomers made their solar eclipse predictions public in advance, ordinary people were afraid of eclipses, because they regarded the interruption in the light of the sun as a breach of the normal course of nature. This effect can still be seen in modern times, particularly in rural areas. The awesome appearance of a total solar eclipse was especially frightening to medieval people, who watched such a rare event only once in their lifetime. There is an interesting report from Ibn al-Athīr (X, 78) who was eyewitness of a total eclipse in his youth in 571A.H/1176 A.D:

> "In this year in the month Ramaḍān the sun was eclipsed totally and the earth was in darkness so that it was like a dark night and the stars appeared. That was before noon of Friday the 29th of Ramaḍān at Djazira Ibn 'Umar (Ibn 'Umar's island)[2], when I was young and in the company of my arithmetic teacher. When I saw it, I was very much afraid; but I held on to him and my heart was strengthened. He was also learned in astronomy and told me, 'Now you will see that all of this will go away', and it went quickly."

The reports of solar eclipses in the medieval Islamic period can be classified into four groups, according to the social and cultural information contained in them:[3]

1- Reports explaining religious aspects of eclipses, which may involve ordinary people and religious leaders, particularly in performance of prayer for eclipse.

2- Reports describing the appearance of solar eclipses, such as its darkness and duration. Some reports in this category include short descriptions on the effect of solar eclipse on nature.

3- Reports showing the interaction between astronomers and society relating to the prediction of solar eclipses.

1. The hour of emersion is erroneous, because calculations show that the eclipse in Baghdad ended after about 1:10h after the total phase.
2. This is now known as Cizre, a Turkish town on the frontier with Syria.
3. In some reports, one can find a combination of different subjects.

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4- A few reports describing the fear experienced by the people who are confronted with the awesome appearance of a total solar eclipse.

The cultural and social influences of solar eclipses in medieval Islamic society can only be studied through chronicles and travel accounts.[1] Although *zīj*es contain very valuable astronomical data on eclipses (as in the case of Ibn Yūnus above), they rarely include information on the effects on society. Relatively few Arabic and Persian chronicles and travel account have appeared in print, so only a limited number of reports of eclipses from the medieval Islamic are known today. Many further reports, containing interesting cultural and social information, may well be hidden in unpublished manuscripts which await future investigation.

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1. For a research on the records of solar eclipses in the Arabic chronicles and their validity from the astronomical point of view, see Said et al, 38-64; only a few of these reports include some information on social aspects of solar eclipses in medieval Islamic period.

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