

moment of day or night. Therefore, it is very possible that in one month the moon is full at 7:00 AM. This moon would be 99% lit on the night before and becomes full in the morning, but decreases to 99% lit-up on the following night. Such a moon would appear as a full moon to an observer on both nights. These two nights could be 13th and 14th, or 14th and 15th depending upon the location on earth and the new moon birth universal time.

To start an Islamic month correctly, we must examine sighting claims in light of knowledge that Allah (SWT) has given us. Let us pray to Allah (SWT) to open our hearts and minds to understand these facts about moon-sighting.

Let us further pray to Allah Almighty that He may guide us to the right path, forgive us for our mistakes and make us united in the way He pleases. Ameen.

About the author: Syed Khalid Shaukat

has made significant contributions in Science and Engineering. In addition, he attended an Islamic school for seven years studying Arabic, Islamic Studies, Tajweed, Tafseer, Hadith, and Fiqh. As a Muslim scientist specialized in mathematics, computer programming, and astronomy, he has researched qibla direction, prayer timings, and moon-sighting. For over 20 years, he has been providing prayer schedules for various places throughout the world including USA, Canada, Russia, China, India, Pakistan, Gambia, Ivory Coast, Zaire, Zimbabwe, Puerto Rico, Colombia, Chile, and even polar regions (Norway and Alaska), where day and night are several months long. He has helped several mosques in USA, Canada, and Puerto Rico for qibla orientation.

Involved with the Committee For Crescent Observation, International, Khalid Shaukat collects and correlates moon-sighting observations with calculations for the entire world. He has published several articles on these subjects in periodicals of Islamic Society of North America (ISNA), and of Islamic Circle of North America (ICNA). He has presented papers at Islamic seminars at various occasions, including the ISNA Annual Conventions in the past few years. He is a consultant to the Fiqh Council of North America for moon-sighting and qibla direction issues. He is also a consultant to the Islamic Shura Council of North America (which comprises of four major Islamic organizations: ISNA, ICNA, Ministry of W. Deen Mohammad, and Jamaat Community of Imam Jamil Al-Amin).

Misconception 3: If the moon is thick and remains on the horizon a long time, it must be the 2nd day moon.

This is a very common argument that we hear repeatedly, but has no truth in it. This can be clarified with the help of Figure 3. If on the 29th day, the moon at sunset is 18 hours old and is higher above the glare of the sun, it may be visible on that day and will appear to be very thin. However, if the 18 hours old moon on the 29th day is very low on the horizon, it would not be visible on that day, then on the 30th day it would be 42 hours old and quite thick, and remains above the horizon a long time, but it was not visible the day before.

29th days moon when it is 18 hours old and is not visible because it is very close to the horizon and disappears in the glare of the sun. On the next day the moon is 42 hours old, therefore, quite thick, and is higher above the glare of the sun, therefore remains above horizon a long time, but it is the first day crescent, because it was not visible the day before.

Misconception 4: There is a dark side of the moon.

Many a times you hear the phrase, "Dark Side of the Moon." People think that the far side of the moon is the dark side of the moon, and that the dark side faces us at the time of new moon. That is not the case. The same side of the moon always faces the earth, sometimes illuminated, and sometimes dark. The moon takes 27 days, 7 hours, and 43 minutes to spin, or rotate, once on its axis. It takes the same amount of time to orbit the earth. The combination of the two motions keeps the same side of the moon facing the earth. To us on earth, the moon is fully illuminated at full moon, completely dark at new moon, and partially lit in between.

Misconception 5: Three consecutive months of 30 days are not possible.

Three consecutive months of 30 days are very possible and are not uncommon. In fact even four consecutive months of 30 days is possible, but rare. This is mainly due to broadening the Matla' over 48 contiguous states of USA as one Matla'. The Committee for Crescent Observation, Ithaca, New York has documented the moon-sighting for every month for various locations throughout the world spanning last two decades, and confirms that three consecutive months of 29 days, and four consecutive months of 30 days are possible for USA.

Misconception 6: Full moon occurs on the 14th night. This is wrong too. Full moon is the instant of time when the earth is between the moon and the sun in the same vertical plane. This could happen at any

A crescent within an altitude of 10 degrees is usually not visible. For a sightable crescent from any location, the following parameters are most important:

1. Angular separation of the moon from sun as seen from earth. (This is also called elongation, or arc of light, or simply angle from sun)

2. Moon's altitude above the horizon.

It is also a scientific fact that, if the moon is visible anywhere on the globe, it would be more easily visible on all places west of it. On the contrary, we hear news of moon-sighting in the Middle East, and on the same evening, here in North America several hours later, it is not visible despite clear horizons. This is against known scientific facts. This clearly tells us that what was seen in the Middle East could not have been the moon. Muslim astronomers in this age of technology are now in a position to calculate the dates for possible/impossible moon-sighting.

So the validity of sighting claims can be easily verified for correct moon-sighting.

Here are some common misconceptions about moon sighting that people talk about.

Misconception 1: 29th day moon is always thin and 30th day moon is thick. In fact, it is very possible that the 30th day moon of one month is about the same thickness as 29th day moon of another month.

The moon revolves around the earth in an elliptical orbit, therefore, sometimes it is closer to the earth and sometimes it is farther from the earth. In Figure 1, the left hand side picture is an example of 29th day moon of one month when it is closer to the earth and its age is 20 hours, while the right hand side of the picture shows 30th day moon of another month that is farther from earth with the age 25 hours. To an observer from earth, both of these crescents would appear to be about the same thickness.

Misconception 2: 29th day moon sets in a short time while 30th day moon remains longer on the horizon.

The horizontal line represents the horizon of an observer from earth looking for the moon. In the left hand side picture the 29th day moon of one month is closer to the horizon but moves along a slanting path and eventually sets below horizon. In the right hand side picture the 30th day moon at another location is higher above the horizon, but moves almost vertically downwards and takes less time to go below the horizon as compared to the left hand side case. Therefore, it is not correct to say that the 30th day moon remains longer on the horizon.

The science of moon-sighting

Syed Khalid Shaukat

This is an attempt to present a clear perspective of the science of moon-sighting and to clarify some of the common misconceptions about moon-sighting.

Main Factors for Crescent Visibility:

Most people associate visibility with the age of the moon. The age of the moon is simply the time lapsed since the new moon. Crescent formation depends upon the angular separation of the moon from the sun as seen from the earth. As time passes from the instant of new moon, the moon moves slower than the sun appears to move (because of rotation of the earth). This causes the angular separation between the sun and the moon and the formation of the crescent.

The earth revolves around the sun in an elliptical orbit, with the sun off-center, and the moon revolves around the earth in a similar way. When the new moon occurs, the sun, moon, and earth come in line as shown, and no light of the sun falling on the moon can come to the earth, so it is a dark or invisible moon. About 18-24 hours after new moon, the moon moves away from the line of earth and sun, to its new location as shown by the location of the crescent moon. Now sun and moon have separated from the same line.

The angle subtended by sun, earth, and moon is the "angular separation." This angular separation causes the crescent to form. Until this angle becomes 7 degrees, no light of the sun reflected by the moon can come to the earth, because of the mountains on the surface of the moon that block the sun's light (Danjon 1932). This angle must be about 10-12 degrees for the sun's light to reflect from the moon, making a thin crescent which can be sighted.

Sometimes, this crescent is very thin and very low on the horizon, so it can not be seen as it disappears in the glare of sun, and therefore is not visible, even though it may remain above horizon for 20-30 minutes after sunset. Another important factor is the moon's altitude above the horizon. If the crescent thickness is sufficient, but it is not above the horizon, then it can not be seen. This happens in the month of September and October in the USA, when the moon is in the southern hemisphere, therefore, it can not be seen from northern hemisphere. If the moon is above the horizon but close to it within the glare of the sun, then it may not be visible.