On the Visibility of Sirius in Daylight

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A note on the visibility of Sirius and other bright celestial objects observed in clear skies a little south of the equator and elsewhere.

INTRODUCTION

It is a well-known fact that Venus may be seen with the naked eye in daylight at any time of the day. However, I was amazed to find, about fourteen years ago, that Jupiter is also visible. One had to know exactly where to look, but if the Moon was near, then finding the planet was not difficult. When the BAA *Handbook* ephemeris on Jupiter was checked, I was surprised to learn on that occasion the magnitude of the planet was only −1·6. That made it only about 0^m2 brighter than Sirius. The question then arose as to whether or not Sirius itself was a daytime object. I undertook a series of checks on Sirius, and also on Vega in an attempt to observe them in daylight with the naked eye. Unfortunately, however, Sirius does not attain a high altitude from Great Britain, and the resulting high air mass probably prevented it from rising above the threshold of naked eye visibility. All my attempts to observe stars in daylight met with failure until recently, when I moved to Zimbabwe. Now I am living 18° south of the equator, and at an altitude of about 1100 metres above sea level. Sirius passes overhead and is particularly well placed for observation in the months of September/October, and March/April, when it passes overhead at sunrise and sunset, respectively.

OBSERVATIONS

On 1981 October 27, I observed Sirius with the naked eye, noting its position relative to some telephone wires which passed overhead. The twilight brightened rapidly during a spectacular tropical dawn, until at 0329 UT the Sun was above the eastern horizon. Sirius was still visible with the naked eye, and with binoculars it was easy.

Locating and observing Sirius at morning quadrature was not difficult since I had the benefit of finding Sirius in a dark sky before sunrise. Six months later, at evening quadrature, things were harder. I would have to find Sirius before the Sun went down. To achieve this, in twilight, the path of Sirius was noted with respect to the branches of a tree which passed overhead. The position of the star would not have altered radically since the Sun had set. I would then go out again the following day, and using my 12×40 binoculars recover the star before sunset.

Success finally came on 1982 March 13. About an hour before sunset I recovered Sirius with binoculars, and twenty minutes before sunset I detected it with the naked eye. It was a difficult observation, but I could definitely hold the star by direct vision, first with my left eye, and then with both.

I had confirmed my observation of October 27, and repeated the observations on subsequent occasions providing conclusive evidence that the star could be seen. Furthermore, a colleague in Harare, Richard Fleet, was able to confirm the observations himself. In addition, he added that the presence of cloud in the neighbourhood of the star was an aid to focusing the eyes on infinity. It seems that from at least twenty minutes prior to sunset the sky is already darkening, thus enabling the star to appear.

Now that Sirius has been confirmed as a daylight object, I wanted to determine the threshold value for naked eye daytime visibility. I attempted further observations on Canopus, and found it to be a borderline case. Canopus was observed on 1982 October 31, and was held with the naked eye almost to the point of sunrise. Sirius, however, remained visible for a further twenty minutes. Had Canopus been at a higher altitude, it may have been visible for a few minutes after the Sun came up. Earlier in 1982 observations were made of α Centauri and Arcturus, and though daytime visibility in binoculars was confirmed (α Centauri was even resolved), neither star was visible with the naked eye.

CONCLUSIONS

Thus the threshold value for naked eye visibility appears to be around mag. −1. Canopus, at mag. −0·9, may be visible if it is overhead and the observer has particularly keen eyesight. It can now safely be said that any other stellar object cannot be observed with the naked eye in daylight, and Sirius can only be seen when the conditions are right.

Clearly, then, the conditions for the naked eye daytime visibility of Sirius are very critical. These can be summarized as follows:

(1) The star must be in the right position with respect to the Sun—*i.e.* at either one or other of the quadratures.

(2) The star must reach a high altitude, preferably overhead.

(3) Skies of perfect transparency are essential. These may be obtained at high altitudes, in rural areas, or both.

(4) The observer should have good eyesight. Any slight astigmatism may render the star invisible.

Now that I have confirmed the naked eye-daytime visibility of Sirius, I was interested to see if anyone had observed it before. Allen[1] reports that a naked-eye observation of Sirius in daylight was made by W. C. Bond when he was director of Harvard College Observatory, at Cambridge, Massachusetts. He adds that other observers have seen Sirius at midday with only slight optical aid. Hornby[2] reports that stars as faint as Polaris are visible with a 40 mm telescope, ×25.

It has often been rumoured that it is possible to see stars in daylight by observing a small area of sky through a mine shaft or a chimney stack. The exclusion of the extraneous light was thought to render the stars visible, and there are numerous reports of miners seeing stars by this method during the day. However, in recent years, this method has been tested, and the results have proved negative.[3]

Further back in time, Sirius is known to have been particularly important to the ancient Egyptians. They used the star for calendrical purposes and the Sothic Cycle is based on their observations. However, the Egyptians observed the heliacal rising of Sirius and tried to determine the date each year when Sirius first became visible in the morning sky. This fact is now well established,[4,5] and it appears to have no connection with daytime visibility.

To conclude, it is now firmly established that Sirius is a naked-eye daytime object under certain conditions. The threshold value for daytime visibility with the naked eye appears to be around mag. −1, and any object fainter than this will not be visible. It is interesting to speculate how often in the remote past stars have wandered into the solar neighbourhood to become visible in daylight. Luminous supergiants such as Rigel would only have to approach the Sun within 100 light-years in order to become conspicuous objects in the daytime sky.

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