

DARK SKIES for August 2020:

S/S Aug.	1/2	none	
S/M Aug.	2/3	none	
M/T Aug.	3/4	none	
T/W Aug.	4/5	none	
W/T Aug.	5/6	none	
T/F Aug.	6/7	10:07 p.m.	- 10:12 p.m.
F/S Aug.	7/8	10:05 p.m.	- 10:34 p.m.
S/S Aug.	8/9	10:04 p.m.	- 10:56 p.m.
S/M Aug.	9/10	10:02 p.m.	- 11:18 p.m.
M/T Aug.	10/11	10:00 p.m.	- 11:42 p.m.
T/W Aug.	11/12	9:58 p.m.	- 12:09 a.m. !
W/T Aug.	12/13	9:55 p.m.	- 12:40 a.m. !
T/F Aug.	13/14	9:53 p.m.	- 1:18 a.m.
F/S Aug.	14/15	9:51 p.m.	- 2:04 a.m.
S/S Aug.	15/16	9:49 p.m.	- 3:01 a.m.
S/M Aug.	16/17	9:47 p.m.	- 4:06 a.m.
M/T Aug.	17/18	9:45 p.m.	- 4:23 a.m.
T/W Aug.	18/19	9:43 p.m.	- 4:25 a.m.
W/T Aug.	19/20	9:41 p.m.	- 4:26 a.m.
T/F Aug.	20/21	9:39 p.m.	- 4:28 a.m.
F/S Aug.	21/22	9:45 p.m.	- 4:30 a.m.
S/S Aug.	22/23	10:13 p.m.	- 4:31 a.m.
S/M Aug.	23/24	10:42 p.m.	- 4:33 a.m.
M/T Aug.	24/25	11:14 p.m.	- 4:34 a.m.
T/W Aug.	25/26	11:51 p.m.	- 4:36 a.m.
W/T Aug.	26/27	12:34 a.m.	- 4:37 a.m.
T/F Aug.	27/28	1:24 a.m.	- 4:39 a.m.
F/S Aug.	28/29	2:21 a.m.	- 4:40 a.m.
S/S Aug.	29/30	3:23 a.m.	- 4:42 a.m.
S/M Aug.	30/31	4:28 a.m.	- 4:43 a.m.
M/T Aug.	31/1	none	

Times listed are for Dodgeville, Wisconsin when

(1) Moon is below the horizon

(2) Sun is > 18° below the horizon
(astronomical twilight)

Time Travel

conducted by David Oesper

Continued from last month...

Hunting for Comets and Planets*

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As a result of this work of Tremaine, the time has come to take a new look at an old question. Is it possible to see comets in their natural habitat, in the reservoir where they live when they are not making their final and suicidal dive toward the Sun? So long as we believed that the main reservoir was the Oort Cloud, the answer to this question was clearly negative. The Oort Cloud is too far away and the comets are too small. But if, as Tremaine's analysis indicates, there is a second large reservoir in the Kuiper

Belt, the prospects for direct observation of comets are vastly improved. There are three reasons why the Kuiper Belt is easier to observe. First, it is a hundred times less distant. Second, it is concentrated in the ecliptic plane instead of being scattered all over the sky. Third, if Kuiper's estimate of the population is correct, the Belt contains a larger number of comets than the Cloud.

3 OCCULTATION ASTRONOMY

Several astronomers have studied seriously the possibility of seeing comets in the Kuiper Belt by detecting their reflected sunlight with a large telescope. Unfortunately the brightness of reflected sunlight decreases with the inverse fourth power of the distance from the Sun. It is easy to estimate the brightness of a comet in the Belt by comparing it with Neptune. Neptune, with a diameter of 4×10^4 km and a high optical albedo, has visual magnitude 7.6. If we assume optimistically that a comet is situated at Neptune's distance at the inner edge of the Belt, with an albedo as high as Neptune and a diameter of 10 km, as large as Halley's comet and much larger than the majority of comets, then its visual magnitude turns out to be 26. A magnitude 26 object is barely detectable in a large telescope under conditions of excellent seeing. It would be difficult to justify the use of prime time on a large telescope for comet-hunting. The most we can hope for in this direction is that Kuiper Belt comets may occasionally be found on exceptionally deep images of patches of sky made for other purposes. It is possible that the Belt may contain a substantial population of larger objects with diameters greater than 100 km and visual magnitudes around 20. Such objects, if they exist, could be found and identified as a by-product of various sky-survey projects that are now going forward.

So far as the great majority of ordinary comets is concerned, even if they are as near to us as Neptune, optical detection using reflected sunlight is hopeless. This brings me to the main subject of my talk, occultation astronomy. Occultation astronomy means looking for dark objects in the sky by observing occultations of bright objects that are further away. So far as I know, the first suggestion that one could look for comets by observing occultations of stars was published in *Nature* 15 years ago by Mark Bailey, at that time a student in Edinburgh (Bailey 1976). Bailey stated clearly the essential facts, that occultations by comets in the Kuiper Belt could be observed but that occultations by comets in the Oort Cloud could not. Everything I shall say in this talk is based on Bailey's two-page letter. My proposals are substantially the same as his. It is unfortunate that Bailey's ideas received little attention at the time they were published. Bailey suffered the usual fate of the premature discoverer.

* The text of the Milne Lecture, delivered 1991 October 24.

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To be continued next month...