DARK SKIES for October 2020:

T/F Oct.	1/2	none
F/S Oct.	2/3	none
S/S Oct.	3/4	none
S/M Oct.	4/5	8:09 p.m. - 8:12 p.m.
M/T Oct.	5/6	8:07 p.m. - 8:39 p.m.
T/W Oct.	6/7	8:05 p.m. - 9:10 p.m.
W/T Oct.	7/8	8:04 p.m. - 9:49 p.m.
T/F Oct.	8/9	8:02 p.m. - 10:34 p.m.
F/S Oct.	9/10	8:00 p.m. - 11:29 p.m.
S/S Oct.	10/11	7:59 p.m. - 12:32 a.m.
S/M Oct.	11/12	7:57 p.m. - 1:41 a.m.
M/T Oct.	12/13	7:55 p.m. - 2:55 a.m.
T/W Oct.	13/14	7:54 p.m. - 4:11 a.m.
W/T Oct.	14/15	7:52 p.m. - 5:29 a.m.
T/F Oct.	**15/16**	**7:50 p.m. - 5:41 a.m.**
F/S Oct.	**16/17**	**7:49 p.m. - 5:42 a.m.**
S/S Oct.	**17/18**	**7:47 p.m. - 5:44 a.m.**
S/M Oct.	**18/19**	**7:46 p.m. - 5:45 a.m.**
M/T Oct.	19/20	8:22 p.m. - 5:46 a.m.
T/W Oct.	20/21	9:10 p.m. - 5:47 a.m.
W/T Oct.	21/22	10:05 p.m. - 5:48 a.m.
T/F Oct.	22/23	11:06 p.m. - 5:49 a.m.
F/S Oct.	23/24	12:11 a.m. - 5:50 a.m.
S/S Oct.	24/25	1:16 a.m. - 5:52 a.m.
S/M Oct.	25/26	2:20 a.m. - 5:53 a.m.
M/T Oct.	26/27	3:23 a.m. - 5:54 a.m.
T/W Oct.	27/28	4:24 a.m. - 5:55 a.m.
W/T Oct.	28/29	5:24 a.m. - 5:56 a.m.
T/F Oct.	29/30	none
F/S Oct.	30/31	none
S/S Oct.	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)

Please minimize your use of outdoor lighting during these times to give everyone the best possible view of the night sky.

Time Travel

conducted by David Oesper

Continued from last month...

Hunting for Comets and Planets*

Freeman J. Dyson
Institute for Advanced Study, Princeton, New Jersey, USA

(Received 1991 November 4)

Since the shadow of a comet travels over the Earth at about 30 km s^{-1}, a 1 km comet will occult a star for only 30 ms. The star will blink out for a thirtieth of a second. To detect such a quick blink, the telescope must be provided with a multichannel photometric detector, with one channel for each star, counting the photons as they come in and reading out the numbers of photons every hundredth of a second. When a star is occulted, its photon count should be low in at least three consecutive read-outs. We can estimate roughly the size of telescope required to give enough photons to detect an occultation reliably. A star of magnitude 13 supplies about 3×10^5 photons m^{-2} s^{-1}. If we use a 30 cm or 12" telescope, and detect the photons with 50% efficiency, this will give a hundred detected photons per read-out for each star, enough to make an accidental coincidence of three consecutive low counts very unlikely. But the statistical fluctuation of photon-counts is not the most serious cause of spurious events. The more serious problem is the twinkling of the star caused by turbulence of the atmosphere. The frequency of false occultation signals caused by atmospheric turbulence must be measured empirically before an effective observation-system can be designed.

No matter whether the effects of atmospheric seeing turn out to be mild or severe, we shall need to deploy several telescopes along the track of a comet's shadow and correlate their outputs in order to be sure that we have a genuine occultation. We know that the shadow-track should run from East to West at about 30 km s^{-1}. If we put three or four telescopes a few km apart in an East-West line, the occurrence of three or four blinks separated by a few tenths of a second in sequence will give a secure identification of a comet. There will also be sequences of blinks produced by shadows travelling at the wrong speed for a comet. These will give evidence for occultations of stars by other objects such as nearby asteroids, fragments of debris in orbit around the Earth, high-flying aeroplanes, meteorological balloons, birds and bats. One person's noise is another person's signal. As a by-product of a system built to observe comets, we may obtain important information about the movements of migrating birds and bats.

The telescopes and photometers required for the monitoring of occultations are simple and fairly cheap. The telescopes need only be programmed to stare at the same group of stars, night after night, without human intervention, as the stars drift across the sky. High optical precision is not needed. The difficult part of the operation is the distribution and coordination of huge quantities of data. Each telescope will be reading out photon-counts from a hundred stars a hundred times a second. All these numbers must be fed by datalinks with accurate timing to a central computer. The computer must then correlate them, pick out the events which show correct time-delays between responses of several telescopes, and send the records of all interesting events to a databank for permanent storage. The most expensive part of the project will probably the installation and maintenance of the communication and data-processing equipment.

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

Quarterly Journal of the Royal Astronomical Society (1992), **33**, 45-57

To be continued next month...