

## DARK SKIES for December 2017:

F/S Dec.	1/2	none	
S/S Dec.	2/3	none	
S/M Dec.	3/4	none	
M/T Dec.	4/5	none	
T/W Dec.	5/6	6:07 p.m.	- 6:58 p.m.
W/T Dec.	6/7	6:07 p.m.	- 8:06 p.m.
T/F Dec.	7/8	6:07 p.m.	- 9:16 p.m.
F/S Dec.	8/9	6:08 p.m.	- 10:25 p.m.
S/S Dec.	9/10	6:08 p.m.	- 11:33 p.m.
S/M Dec.	10/11	6:08 p.m.	- 12:38 a.m.
M/T Dec.	11/12	6:08 p.m.	- 1:41 a.m.
T/W Dec.	12/13	6:08 p.m.	- 2:43 a.m.
W/T Dec.	13/14	6:08 p.m.	- 3:43 a.m.
T/F Dec.	14/15	6:09 p.m.	- 4:43 a.m.
F/S Dec.	15/16	6:09 p.m.	- 5:41 a.m.
<b>S/S Dec.</b>	<b>16/17</b>	<b>6:09 p.m.</b>	<b>- 5:43 a.m.</b>
<b>S/M Dec.</b>	<b>17/18</b>	<b>6:10 p.m.</b>	<b>- 5:43 a.m.</b>
<b>M/T Dec.</b>	<b>18/19</b>	<b>6:10 p.m.</b>	<b>- 5:44 a.m.</b>
<b>T/W Dec.</b>	<b>19/20</b>	<b>6:10 p.m.</b>	<b>- 5:45 a.m.</b>
W/T Dec.	20/21	6:50 p.m.	- 5:45 a.m.
T/F Dec.	21/22	7:46 p.m.	- 5:46 a.m.
F/S Dec.	22/23	8:44 p.m.	- 5:46 a.m.
S/S Dec.	23/24	9:43 p.m.	- 5:47 a.m.
S/M Dec.	24/25	10:45 p.m.	- 5:47 a.m.
M/T Dec.	25/26	11:48 p.m.	- 5:47 a.m.
T/W Dec.	26/27	12:53 a.m.	- 5:48 a.m.
W/T Dec.	27/28	2:01 a.m.	- 5:48 a.m.
T/F Dec.	28/29	3:12 a.m.	- 5:48 a.m.
F/S Dec.	29/30	4:24 a.m.	- 5:49 a.m.
S/S Dec.	30/31	5:37 a.m.	- 5:49 a.m.
S/M Dec.	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.

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## Time Travel

conducted by David Oesper

### THE RISE AND FALL OF EDWARD S. HOLDEN: PART 1

DONALD E. OSTERBROCK, University of California

Hall believed that there was a good chance that the planet Mars had one or more moons, and determined to search for them. His opportunity came in the summer of 1877, when Mars had a favourable opposition, bringing it unusually close to the Earth. He had only one problem—he wanted to get rid of his assistant, Holden, so that he could make the discovery unaided, and reap all the credit alone. Then, according to Hall, “by the greatest good luck Dr. Henry Draper invited [Holden] to Dobb’s Ferry at the very

nick of time. He could not have gone much further than Baltimore when I had the first satellite nearly in hand”. Hall discovered two small satellites of Mars, ultimately named Deimos and Phobos, moving rapidly in small orbits close about the planet. As soon as they heard of the discovery Holden and Draper tried, with the latter’s telescope at his own private observatory, to see if they could find another Martian moon. For a time they thought they had found one, but it proved a false alarm; then soon after he had returned to the Naval observatory, Holden thought he had discovered another. It too, however, “not only violate[d] Kepler’s third law but also the simplest rules of geometry”, as Hall said, and its “existence [was] therefore a mathematical impossibility”. This purported discovery became well known to working astronomers through the rumor mill, and it was to haunt Holden whenever the question of his research abilities surfaced. Thus for instance fourteen years later, John Brashear, in commenting sarcastically on a newspaper article which incorrectly reported that Holden had photographed snow on a mountain on the Moon, wrote “Well, that isn’t quite as bad as his Washington discovery of the third Sat[ellite] of Mars!”

The truth is, though Holden was highly intelligent and a hard worker, full of interest in astronomy, he was not a particularly good research scientist. He was not a gifted observer, like Hall, nor a master theoretician of celestial mechanics, like Newcomb. Most of his papers were of very little importance. His *magnum opus* at the Naval Observatory was a monograph on the central bright part of the Orion Nebula. It was based on a complete literature search, and contained a summary of all the visual observations on the form, structure and appearance of the nebula, going back even before Christiaan Huyghens, commonly believed to have discovered it with a 2-inch telescope in 1656. One J. B. Cysat of Lucerne had, Holden reported, first seen the Orion Nebula “as a white cloud of diffuse pure light” with his naked eye in 1618. Holden quoted with equal ease reports in French, German and Latin, and ended the paper with his own visual observations of the nebula with the Naval Observatory 26-inch. Holden made photometric measurements of the nebula, using an apparatus designed for him by Charles S. Hastings, who was professor of physics at Johns Hopkins University. An oil lamp illuminated a piece of paper the same colour as the nebula, and its image was projected into the eyepiece of the telescope and compared with a small portion of the nebula. By moving the lamp, the surface brightness of the artificial image could be changed until it matched the surface brightness of the nebula. Variations in the brightness of the lamp, the main problem in the instrument, were compensated by normalizing all the measurements to one point in the nebula, which, however, was difficult to locate exactly in practice. Holden believed his measurements showed clear evidence for time variations of the relative brightnesses of various spots in the nebula over a two-year interval from 1878 to 1880.

*Journal for the History of Astronomy*, Vol 15:2, No. 43, 1984