

## DARK SKIES for November 2017:

|                 |              |                  |   |                  |
|-----------------|--------------|------------------|---|------------------|
| W/T Nov.        | 1/2          | 5:27 a.m.        | - | 5:59 a.m.        |
| T/F Nov.        | 2/3          | none             |   |                  |
| F/S Nov.        | 3/4          | none             |   |                  |
| S/S Nov.        | 4/5          | none             |   |                  |
| S/M Nov.        | 5/6          | none             |   |                  |
| M/T Nov.        | 6/7          | 6:23 p.m.        | - | 7:15 p.m.        |
| T/W Nov.        | 7/8          | 6:22 p.m.        | - | 8:12 p.m.        |
| W/T Nov.        | 8/9          | 6:21 p.m.        | - | 9:16 p.m.        |
| T/F Nov.        | 9/10         | 6:20 p.m.        | - | 10:22 p.m.       |
| F/S Nov.        | 10/11        | 6:19 p.m.        | - | 11:29 p.m.       |
| S/S Nov.        | 11/12        | 6:18 p.m.        | - | 12:36 a.m.       |
| S/M Nov.        | 12/13        | 6:17 p.m.        | - | 1:41 a.m.        |
| M/T Nov.        | 13/14        | 6:17 p.m.        | - | 2:45 a.m.        |
| T/W Nov.        | 14/15        | 6:16 p.m.        | - | 3:48 a.m.        |
| W/T Nov.        | 15/16        | 6:15 p.m.        | - | 4:50 a.m.        |
| <b>T/F Nov.</b> | <b>16/17</b> | <b>6:14 p.m.</b> | - | <b>5:16 a.m.</b> |
| <b>F/S Nov.</b> | <b>17/18</b> | <b>6:14 p.m.</b> | - | <b>5:17 a.m.</b> |
| <b>S/S Nov.</b> | <b>18/19</b> | <b>6:13 p.m.</b> | - | <b>5:18 a.m.</b> |
| <b>S/M Nov.</b> | <b>19/20</b> | <b>6:12 p.m.</b> | - | <b>5:19 a.m.</b> |
| M/T Nov.        | 20/21        | 6:28 p.m.        | - | 5:20 a.m.        |
| T/W Nov.        | 21/22        | 7:14 p.m.        | - | 5:21 a.m.        |
| W/T Nov.        | 22/23        | 8:03 p.m.        | - | 5:22 a.m.        |
| T/F Nov.        | 23/24        | 8:57 p.m.        | - | 5:23 a.m.        |
| F/S Nov.        | 24/25        | 9:54 p.m.        | - | 5:24 a.m.        |
| S/S Nov.        | 25/26        | 10:53 p.m.       | - | 5:25 a.m.        |
| S/M Nov.        | 26/27        | 11:54 p.m.       | - | 5:26 a.m.        |
| M/T Nov.        | 27/28        | 12:58 a.m.       | - | 5:27 a.m.        |
| T/W Nov.        | 28/29        | 2:04 a.m.        | - | 5:28 a.m.        |
| W/T Nov.        | 29/30        | 3:13 a.m.        | - | 5:29 a.m.        |
| T/F Nov.        | 30/1         | 4:24 a.m.        | - | 5:30 a.m.        |

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

Young Holden was a good student and immediately attracted the attention of William Chauvenet, the professor of mathematics and astronomy and chancellor of Washington University. Chauvenet had a good knowledge of mathematical astronomy and had written a much used textbook on the subject. Holden became his protégé, and when Chauvenet had to take a leave from his duties on account of his health, the young student accompanied the chancellor and his family to St Paul and continued his studies there. By this time Holden had decided to make

astronomy his career. He returned to Washington University with his mentor as soon as the older man was able to take up his work again. In 1866 Holden, still not quite twenty years old, graduated with a B.S. degree. That same summer his father died, also of cholera, and the would-be scientist was completely on his own.

He managed to get an appointment to West Point, one of the few sources of a technical education accessible to a young man without a family to pay his expenses. With his background and training, Holden had little trouble establishing himself as one of the top students in his class. He became a convinced believer in the “Duty-Honor-Country” system inculcated at the Military Academy, and years later when he wrote an article on education for a ladies’ magazine, he strongly advocated that the methods which had proved so successful at West Point be adopted by every school in the land.

Along with his free education, West Point provided Holden with a guaranteed job at graduation. As a second lieutenant he served one year in the field with the artillery, and then was ordered back to his alma mater as an instructor. While there he wrote his first scientific papers, short descriptions of the emission-line spectra of lightning and of the aurora borealis. They show that although Holden had mastered the rote-method education of the Military Academy, he had only a distant acquaintance with scientific methodology. He had the very good idea of directly comparing the spectrum of the aurora with the solar spectrum, observed in moonlight, but he did not even attempt to give any of his results numerically in terms of wavelengths. The spectra of air under the excitation conditions prevailing in lightning and in the aurora were almost completely unknown at the time. Holden had recognized an important problem, and he actually saw several of the strongest lines, but his methods were too crude to give any information beyond their colours. His papers could almost have been written by Goethe. They contrast very unfavourably with a highly scientific paper on the spectrum of the aurora written the next year by young Henry A. Rowland, who was Holden’s contemporary.

By the time he got back to West Point, Holden was already applying for a job at the Naval Observatory; in 1873 he became a professor there and resigned his commission in the Army. At first he was assigned to work with the meridian circle, measuring accurate positions of stars, but when the new 26-inch Clark refractor was completed and went into service later that year, Newcomb was put in charge of it, with Holden as his assistant. A few years later, Asaph Hall, a hard-bitten observationalist, took over the 26-inch from Newcomb, who was basically a theoretician, and Holden continued as assistant on what was then the largest refracting telescope in the world.

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