OBSERVATIONS OF THE BRIGHTNESS OF LUNAR ECLIPSES IN THE PHILIPPINES

THE PROBLEM

It is a fact of observation that the brightness of lunar eclipses is not constant. Professional astronomers and amateur observers of the eclipsed moon report eclipses, at times so dim that "the moon was absolutely invisible to the naked eye," [1] but so bright on other occasions that "even during the maximum phases of the eclipse all seas were clearly recognizable." [2] Rzyszczewski, who observed the eclipse of March 21, 1894, in Eastern Siberia under a sky completely pure and with a 7.2 cm. telescope, notes the complete invisibility of the eclipsed part of the moon even in field of the telescope and states that the eclipsed part was much more invisible, both to the naked eye and in the telescope than the ashy disk of our satellite during the first days of the first quarter.[3] Again, Barnard, certainly gifted with keen vision, who had already observed 6 total eclipses, calls the eclipse of October 16, 1902 by far the darkest, to such a degree that for a portion of the time the eastern and western edges could not be seen with the eye, and very few details were visible in the telescope (6 inch) during totality.[4] On the contrary, according to Perrine who observed the eclipse of September 3, 1895, at Mt. Hamilton under a clear sky and air very transparent, "the moon remained plainly visible all through the total phase, the main features being discernible with the naked eye and distinct in the telescope." [5] Again during mid-eclipse all maria were conspicuous both in the 6½ inch reflector and to the naked eye and most of the brightest craters including Tycho and his ray system Copernicus and the Alps were easily seen with the telescope, according to Curtis who observed the eclipse of October 16, 1921 in Winchester, England, under a sky perfectly clear most of the time.[6]

Of all the total lunar eclipses between 1860 and 1927 the following have been reported as dark; 1878 August 12, 1889 January 16, 1889 July 12, 1892 November 4, 1894 March 21, 1903 April 11, 1913 March 21, 1913 September 4, 1919 November 7, 1921 April 21, 1925 February 9. On the contrary the following were reported as bright eclipses: 1877 February 27, 1877 August 23, 1881 December 4, 1888 January 28, 1891 November 15, 1892 May 11, 1894 September 14, 1895 March 10, 1895 September 3, 1896 February 28, 1898 July 3, 1898 December 27, 1899 December 16, 1903 October 6, 1906 February 8, 1906 August 4, 1909 June 3, 1909 November 26, 1910 May 23, 1910 November 16, 1914 March 11, 1917 January 7, 1917 July 4, 1917 December 27, 1920 May 2, 1920 October 26, 1921 October 16, 1923 March 3.

The visibility of the totally eclipsed moon is explained partly by the refraction of light from the earth's atmosphere into the geometrical umbra and partly by the scattering of light into the umbra by dust and air molecules. During the progress of a lunar eclipse, to quote Hogg of the New Zealand Astronomical Society, "the rays of the sun, entering the earth's atmosphere almost horizontally, undergo so much refraction that

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[1] Young, General Astronomy, (1898) p. 254.
[2] B. Mayermann, Astr. Nachr. 215, pp. 34–35, 1921–1922.
[3] A. Rzyszczewski, L'Astronomie, 13, pp. 192–193, 1894.
[4] E. E. Barnard, Astr. Nachr. 161, pp. 81–84, 1903.
[5] C. D. Perrine, Publ. Astr. Soc. Pacific, 7, pp. 289–291, 1895.
[6] A. C. Curtiss, Engl. Mech. 114, p. 168, 1921.

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