and fruitless experiments with two alternately obscured lanterns.

Horrebow and Du Hamel estimated the time occupied in the passage of light from the sun to the earth at its mean distance, according to Römer's first observations of Jupiter's satellites, at 14′ 7″, then 11′; Cassini at 14′ 10″; while Newton*

* Newton, *Optics*, 2d ed. (London, 1718), p. 325. "Light moves from the sun to us in seven or eight minutes of time." Newton compares the velocity of sound (1140 feet in 1″) with that of light. As, from observations on the occultations of Jupiter's satellites (Newton's death occurred about half a year before Bradley's discovery of aberration), he calculates that light passes from the sun to the earth, a distance, as he assumed, of 70 millions of miles, in 7′ 30″; this result yields a velocity of light equal to 155,555$\frac{5}{9}$ miles in a second. The reduction of these [ordinary] to geographical miles (60 to 1°) is subject to variations according as we assume the figure of the earth. According to Encke's accurate calculations in the *Jahrbuch für* 1852, an equatorial degree is equal to 69·1637 English miles. According to Newton's data, we should therefore have a velocity of 134,944 geographical miles. Newton, however, assumed the sun's parallax to be 12″. If this, according to Encke's calculation of the transit of Venus, be 8″·57116, the distance is greater, and we obtain for the velocity of light (at seven and a half minutes) 188,928 geographical, or 217,783 ordinary miles, in a second of time; therefore too much, as before we had too little. It is certainly very remarkable, although the circumstance has been overlooked by Delambre (*Hist. de l'Astronomie Moderne*, tom. ii., p. 653), that Newton (probably basing his calculations upon more recent English observations of the first satellite) should have approximated within 47″ to the true result (namely, that of Struve, which is now generally adopted), while the time assigned for the passage of light over the semi-diameter of the earth's orbit continued to vacillate between the very high amounts of 11′ and 14′ 10″, from the period of Römer's discovery in 1675 to the beginning of the eighteenth century. The first treatise in which Römer, the pupil of Picard, communicated his discovery to the Academy, bears the date of November 22, 1675. He found, from observations of forty emersions and immersions of Jupiter's satellites, "a retardation of light amounting to 22 minutes for an interval of space double that of the sun's distance from the earth." (*Memoirs de l'Acad. de* 1666–1699, tom. x., 1730, p. 400.) Cassini does not deny the retardation, but he does not concur in the amount of time given, because, as he erroneously argues, different satellites presented different results. Du Hamel, secretary to the Paris Academy (*Regiæ Scientiarum Academiæ Historia*, 1698, p. 143), gave from 10 to 11 minutes, seventeen years after Römer had left Paris, although he refers to him; yet we know, through Peter Horrebow (*Basis Astronomiæ sive Triduum Roemerianum*, 1735, p. 122–129), that Römer adhered to the result of 11′, when in 1704, six years before his death, he purposed bringing out a work on the velocity of light; the same was the case with Huygens (*Tract. de Lumine*, cap. i., p. 7) Cassini's method was very different; he found 7′ 5″ for the first satellite, and 14′ 12″ for the second, having taken 14′ 10″ for the basis of his tables for Jupiter *pro peragrando diametri semissi*. The error was therefore on the increase. (Compare Horrebow, *Triduum*, p. 129; Cassini, *Hypothèses et Satellites de Jupiter* in the *Mém de l'Acad.*, 1666–