

temperature they now possess, and which we designate as -76° of a mercury thermometer, had a temperature of about -1400° or even many thousand times lower!

It still remains for us to consider two hypotheses in relation to the existence of a fluid filling the regions of space, of which one—the less firmly-based hypothesis—refers to the *limited transparency* of the celestial regions; and the other, founded on direct observation and yielding numerical results, is deduced from the regularly shortened periods of revolution of Encke's comet. Olbers in Bremen, and, as Struve has observed, Loys de Cheseaux at Geneva, eighty years earlier* drew attention to the dilemma, that since we could not conceive any point in the infinite regions of space unoccupied by a fixed star, *i. e.*, a sun, the entire vault of heaven must appear as luminous as our sun if light were transmitted to us in perfect intensity; or, if such be not the case, we must assume that light experiences a diminution of intensity in its passage through space, this diminution being more excessive than in the inverse ratio of the square of the distance. As we do not observe the whole heavens to be almost uniformly illumined by such a radiance of light (a subject considered by Halley† in an hypothesis which he subsequently rejected), the regions of space can not, according to Cheseaux, Olbers, and Struve, possess perfect and absolute transparency. The results obtained by Sir William Herschel from gauging the

set) to the heating influence of the earth's radiation, and the cooling power of its own into space, would indicate a medium temperature between that of the celestial spaces (-132° Fahr.) and that of the earth's surface below it, 82° Fahr., at the equator, $3\frac{1}{2}^{\circ}$ Fahr., in the Polar Sea. Under the equator, then, it would stand, on the average, at -25° Fahr., and in the Polar Sea at -68° Fahr. The presence of the atmosphere tends to prevent the thermometer so exposed from attaining these extreme low temperatures: first, by imparting heat by conduction; secondly, by impeding radiation outward."—Sir John Herschel, in the *Edinburgh Review*, vol. 87, 1848, p. 222. "Si la chaleur des espaces planétaires n'existait point, notre atmosphère éprouverait un refroidissement, dont on ne peut fixer la limite. Probablement la vie des plantes et des animaux serait impossible à la surface du globe, ou reléguée dans une étroite zone de cette surface." (Saigey, *Physique du Globe*, p. 77.)

* *Traité de la Comète de 1743, avec une Addition sur la force de la Lumière et sa Propagation dans l'éther, et sur la distance des étoiles fixes*; par Loys de Cheseaux (1744). On the transparency of the regions of space, see Olbers, in *Bode's Jahrbuch für 1826*, s. 110-121; and Struve, *Etudes d'Astr. Stellaire*, 1847, p. 83-93, and note 95. Compare also Sir John Herschel, *Outlines of Astronomy*, § 798, and *Cosmos*, vol. i., p. 151, 152.

† Halley, *On the Infinity of the Sphere of Fixed Stars*, in the *Philos. Transact.*, vol. xxxi., for the year 1720, p. 22-26.