approach to the sun, or *perihelion*. In 10,500 years hence it will take place when the earth is at the furthest part of its orbit from the sun, or in *aphelion*. This movement may have had great importance in connection with former secular variations in the eccentricity of the orbit (§ 8).

§ 4. **Change in the Obliquity of the Ecliptic.**—The angle at which the axis of the earth is inclined to the plane of its orbit does not remain strictly constant. It oscillates through long periods of time to the extent of about a degree and a half, or perhaps a little more, on either side of the mean. According to Dr. Croll,[16] this oscillation must have considerably affected former conditions of climate on the earth, since, when the obliquity is at its maximum, the polar regions receive about eight and a half days' more of heat than they do at present—that is, about as much heat as lat. 76° enjoys at this day. This movement must have augmented the geological effects of precession, to which reference has just been made, and which are described in § 8.

§ 5. **Stability of the Earth's Axis.**—That the axis of the earth's rotation has successively shifted, and consequently that the poles have wandered to different points on the surface of the globe, has been maintained by geologists as the only possible explanation of certain remarkable conditions of climate, which can be proved to have formerly obtained within the Arctic Circle. Even as far north as lat. 81° 45′, abundant remains of a vegetation indicative of a warm climate, and including a bed of coal 25 to 30 feet thick, have been found *in situ*.[17] It is contended that when these plants lived, the ground could not have been permanently

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[16] Croll, Trans. Geol. Soc. Glasgow, ii. 177. "Climate and Time," chap. xxv.
[17] Fielden and Heer, Quart. Journ. Geol. Soc. Nov. 1877.