2. *Changes in the time of the perihelion and aphelion.* — The earth is now in aphelion during the northern summer and southern winter. With aphelion in winter, the winters are colder and the summers are warmer than with perihelion in winter. The position of the major axis of the earth's orbit (the extremities of which are the aphelion and perihelion points) is changing, and a complete revolution takes 110,000 years; and since this change is in the opposite direction from that of the precession of the equinoxes, above stated, the *cycle of the seasons* is shortened from 25,868 years to about 21,000 years; for, supposing the perihelion and either equinox to coincide, and then the precession to move in its direction and the perihelion in the opposite, at their respective rates, they would again be in conjunction, in consequence of these rates, in 21,000 years. Hence, *every* 10,500 *years, the seasons become reversed*, that is, the months of winter become the summer months. Another consequence of this aphelion cycle is, that the *winter* and *summer intervals* between the equinoxes vary in relative lengths, the aphelion side being the longer. At the present time the aphelion comes in summer, and the *summer interval is therefore seven days longer than the winter interval.*

3. *Changes in the eccentricity of the earth's orbit.* — The earth's elliptical orbit varies slowly in eccentricity, — that is, in the length of its major axis, — making the aphelion distance greater and the perihelion less, but not varying the mean distance or the amount of heat received annually by the earth from the sun. Maxima in the eccentricity occur once in 100,000 to 200,000 years. One maximum was passed, according to calculated results, about 110,000 years since; another (higher), about 210,000 years since; the next anterior (like the latter in height), about 750,000 years; and a maximum of extreme eccentricity, 850,000 years since. (Stockwell, 1868.)

With the sun's mean distance 92,400,000 miles, the present aphelion distance is about 93,950,000 miles, and the perihelion, 90,850,000 miles, and the eccentricity, 0·0168. But at the time of *extreme maximum* eccentricity (= 0·075 nearly), referred to above, the aphelion distance would be about 99,300,000 miles, and the perihelion 85,500,000, making the sun 13½ millions of miles nearer the earth in summer than in winter.

Owing to the increasing eccentricity there is an increasing difference in the length of the winter interval as compared with the summer interval; and at an extreme maximum it is 33 days longer than the summer interval. As the amount of heat which the earth receives varies inversely as the square of the sun's distance, increasing eccentricity diminishes the amount on the aphelion side and increases it on the other; and if aphelion comes in winter, the winter cold is greatly augmented, besides continuing longer. The summers, on the contrary, would be proportionally hotter, but, in the same proportion, shorter. With aphelion in summer, the winters would be relatively mild and the summers cool. Herschel first drew attention to this effect of extreme eccentricity (1858), and Croll used the facts in his *Climate and Time* (1875) to account for the occurrence of glacial periods in