made an important suggestion in this matter, and subsequently worked out an elaborate development of the whole subject of the physical causes on which climate depends."[41] He was good enough to draw up the following abstract of them for former editions of the present work.

"Assuming the mean distance of the sun to be 92,400,000 miles, then when the eccentricity is at its superior limit, ·07775, the distance of the sun from the earth, when the latter is in the aphelion of its orbit, is no less than 99,584,100 miles, and when in the perihelion it is only 85,215,900 miles. The earth is, therefore, 14,368,200 miles further from the sun in the former than in the latter position. The direct
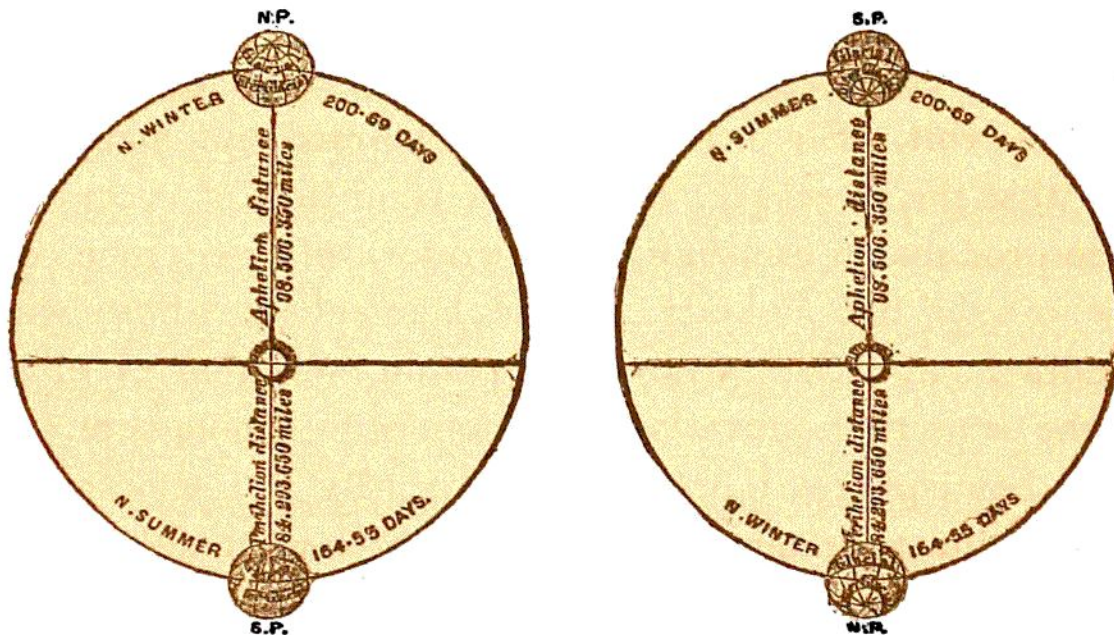


N. Winter Solstice in Aphelion     N. Winter Solstice in Perihelion

Fig. 1.—Eccentricity of the Earth's Orbit in Relation to Climate

heat of the sun being inversely as the square of the distance, it follows that the amount of heat received by the earth in these two positions will be as 19 to 26. The present eccentricity being ·0168, the earth's distance during our northern winter is 90,847,680 miles. Suppose now that, from the precession of the equinoxes, winter in our northern hemisphere should happen when the earth is in the aphelion of its orbit, at the time that the orbit is at its greatest eccen-

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[41] Phil. Mag. xxviii. (1864), p. 121. His researches will be found in detail in his volume "Climate and Time," 1875, and his later work "Discussions on Climate and Cosmology."