restrial and oceanic areas have remained, on the whole, on the same sites from very early geological time. Moreover, as evidence has accumulated in favor of periodic alternations of climate, the conviction has been strengthened that no mere local changes could have sufficed, but that secular variations in climate must be assigned to some general and probably recurring cause.

By degrees, geologists accustomed themselves to the belief that the cold of the Glacial Period was not due to mere terrestrial changes, but was to be explained somehow as the result of cosmical causes. Of various suggestions as to the probable nature and operation of these causes, one deserves careful consideration — change in the eccentricity of the earth's orbit. Sir John Herschel[39] pointed out many years ago that the direct effect of a high condition of eccentricity is to produce an unusually cold winter, followed by a correspondingly hot summer, in the hemisphere whose winter occurs in aphelion, while an equable condition of climate at the same time prevails on the opposite hemisphere. But both hemispheres must receive precisely the same amount of solar heat, because the deficiency of heat, resulting from the sun's greater distance during one part of the year, is exactly compensated by the greater length of that season. Sir John Herschel even considered that the direct effects of eccentricity must thus be nearly neutralized.[40] As a like verdict was afterward given by Arago, Humboldt, and others, geologists were satisfied that no important change of climate could be attributed to change of eccentricity.

The late Dr. James Croll, as far back as the year 1864,

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[39] Trans. Geol. Soc. vol. iii. p. 293 (2d series).

[40] "Cabinet Cyclopædia," sec. 315; "Outlines of Astronomy," sec. 368.