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THE CAUSE OF GLACIAL PERIODS

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Three main causes have been adduced for the great changes in the climates of the upper temperate and polar zones which are so clearly indicated by the geological remains since Eocene times.

These are :

(a) Fluctuations in the eccentricity of the Earth's orbit causing alternate periods (10,500 years for the half cycle) of short-hot summers with long-cold winters and long-cool summers with short-mild winters. The first would be glacial and the second warm inter-glacial periods. This hypothesis is difficult to reconcile with the age of the last glacial period computed from the laminations of glacial clays.

(b) Fluctuation of solar radiation. According to Professor G. C. Simpson the Sun's surface temperature might rise or fall 1000° without much altering the Earth's mean temperature. High radiation would produce extensive cloud formation and heavy rain as on Venus. Low radiation would reduce cloud formation and precipitation as on Mars. Large or small glaciation could be a secondary effect of these changes in precipitation. Thus, rather paradoxically, high radiation might lead to a glacial period. It should be remarked that Croll, the principal exponent of the eccentricity hypothesis, considered that short-hot and long-cold summers would favour glaciation, since the heat would not have time to melt the ice and so raise the air temperatures.

(c) " *Polflucht*," or migration of the pole, either by a rotation of the Earth's axis or by slipping of the crust over the core, is favoured by Köppen, Wegener and Davidson Black. This hypothesis simply means that the Arctic region migrates with the pole (glaciation accentuated possibly by solar radiation). The objections to it are two fold :

(1) There is not at the present time any appreciable polar motion. (A wobble with a 14 month's period and a range of about one half a second of arc has been observed since 1885).

(2) It is difficult to reconcile with the principles of celestial mechanics.