

what is called the crust of the earth, but by no means by sudden upheavals of vast mountain tracts at or near the poles, or anywhere else on the earth's surface; and, indeed, the phenomena of the vegetation of old geological epochs in formations as far north as land has been discovered, seems to me to point in that direction and in no other. At all events it is plain, that no such sweeping changes of physical geography have taken place in those comparatively short episodes of geological history, that have graduated into each other from the beginning of this latest glacial epoch down to the present day, and therefore it is needless to discuss the question here.

There is, however, an astronomical cause which seems to meet all the circumstances of any one glacial epoch, and is therefore deserving of the gravest attention. The question has been worked out with great skill by Dr. James Croll, first, in various memoirs, and latterly, in his celebrated work 'Climate and Time,' and I can only state in a very sketchy manner some of his main conclusions.

Alternations of cold and warm or temperate climates, in the same latitudes, are in the first instance due to the varying eccentricity of the orbit of the earth, by which 'a host of physical agencies are brought into operation, the combined effect of which is to lower to a very great extent the temperature of the hemisphere whose winters occur in aphelion, and to raise to nearly as great an extent the temperature of the opposite hemisphere, whose winters of course occur in perihelion.' It is perhaps possible that the orbit of the Earth may become circular, at periods of time prodigiously far removed from each other, but at present, when the earth in its elliptical orbit is