

(7) Differences in the distribution of land and water in connection with the flow of oceanic currents.

(8) Variations in the properties of the atmosphere with reference to its capacity for allowing the radiation of heat.

Something may be said in favour of all these alleged causes ; but as efficient in any important degree in producing the cold and warm climates of the Tertiary period, the greater number of them may be dismissed as incapable of effecting such results, or as altogether uncertain with reference to the fact of their own occurrence.

(1) That the earth and the sun have diminished in heat during geological time seems probable ; but physical and geological facts alike render it certain that this influence could have produced no appreciable effect, even in the times of the earliest animals and plants, and certainly not in the case of Tertiary floras or faunas.

(2) The obliquity of the ecliptic is not believed by astronomers to have changed to any great degree, and its effect would be merely a somewhat different distribution of heat in different periods of the year.

(3) Independently of astronomical objections, there is good geological evidence that the poles of the earth must have been nearly in their present places from the dawn of life until now. From the Laurentian upward, those organic limestones which mark the areas where warm and shallow equatorial water was spreading over submerged continents, are so disposed as to prove the permanence of the poles. In like manner all the great foldings of the crust of the earth have followed lines which are parts of great circles tangent to the existing polar circles. So, also, from the Cambrian age the great drift of sediment from the north has followed the line of the existing Arctic currents from the north-east to the south-west, throwing itself, for example, along the line of the Appalachian uplifts in Eastern America, and against the ridge of the Cordilleras in the west.