

been many guesses, and which, perhaps, are only now beginning to be understood.

It is not very many years, since a great difference in the geographical distribution of land and sea was regarded as a possible or even a probable cause of the occurrence of important changes of climate during Geological Time. If, said Lyell, in his earlier writings, all the continental lands, were gathered in tropical regions, and the rest of the globe were mainly covered by sea, the climates of the world would be tropical and temperate according to their latitudes, and if all the land were mainly massed round the poles, even in the tropics there would be no tropical heat such as they now endure, while the greater portions of the northern and southern hemispheres would suffer from climates of extreme severity. In such a sketch as this it is needless to argue the question, at all events as regards this special glacial epoch, for the obvious reason that it is an established fact that during most of that epoch, the continents of the world, mountain chains and all, were distributed much as they are at present, with occasional minor variations in detail due to short local submergences.

Neither is it worth while to discuss the facile explanation of variation of climate, being due to the sun with all its planets travelling through alternate hot and cold regions of space. Such an idea crops out now and then in conversation, but I do not remember to have met any educated physicist who seriously entertained it.

I believe that the day may come, when both astronomers and geologists will be forced to allow that, in great cycles of geological time, changes have taken place in the position of the earth's axis of rotation, *in a slowly cumulative manner*, by gradual disturbances of