

the power of geographical change in affecting climatal change, and the fact that such change has occurred at various geological periods, there are some, and especially those who take extreme views as to the latest period of cold climate, who doubt its sufficiency to account for all the phenomena observed. It is instructive, however, to notice that some of the ablest of these, in default of other probable causes, are driven to fall back either on agencies of a wholly improbable character, or to give up the problem as insoluble. Two recent examples of this deserve citation.

The late Dr. Newmayr, of Vienna, a veteran physical geographer, in an able discussion of the climates of past ages, one of his last scientific papers, has fallen back on the hypothesis of a change in the position of the poles.<sup>1</sup> His failure to account for ancient climates by other causes evidently, however, depends on an inadequate conception of the effects of geographical changes, along with serious misconceptions as to the distribution of plants and the characters of vegetation at different periods. These points we shall have to discuss in subsequent pages.

In an address before the American Association, in 1886, Dr. Chamberlain, one of the ablest American authorities on the Glacial period, makes the following remarks as to the causes of the Pleistocene cold:—

“If we turn to the broader speculations respecting the origin of the Glacial epoch, we find our wealth little increased. We have on hand practically the same old stock of hypotheses, all badly damaged by the deluge of recent facts. The earlier theory of northern elevation has been rendered practically valueless; and the various astronomical hypotheses seem to be the worse for the increased knowledge of the distribution of the ancient ice sheet. Even the ingenious theory of Croll

<sup>1</sup> *Society for Dissemination of Natural Science.* Vienna, January, 1889.