

whole process have been utterly frustrated by hot water, or by mere changes of level in the earth's crust, and creation would have been at the mercy of dead forces. The surface would have required again and again the sowing of monads, and there would have been a total failure of crops after all ; for these exterminations continue to occur through all geological time into the Mammalian Age.

II. Again: I have observed that the continent of North America has never been the deep ocean's bed, but a region of comparatively shallow seas, and at times emerging land ; and was marked out in its great outlines even in the earliest Silurian. The same view is urged by De Verneuil, and appears now to be the prevailing opinion among American geologists. The depth at times may have been measured by the thousand feet, but not by miles.

III. During the first half of the lower Silurian era, the whole east and west were alike in being covered with the sea. In the first or Potsdam Period, the continent was just beneath or at the surface. In the next or Trenton Period, the depth was greater, giving purer waters for abundant marine life. Afterwards, the east and west were in general widely diverse in their formations ; limestones, as Mr. Hall and the Professors Rogers have remarked, were generally in progress over the west, that is, the region, now the great Mississippi Valley, beyond the Appalachians, while sandstones and shales were as generally forming from northeastern New York south and southwest through Virginia. The former therefore, has been regarded as an area of deeper waters, the latter as, in general, shallow, when not actually emerged. In fact, the region towards the Atlantic border, afterwards raised into the Appalachians, was already, even before the Lower Silurian era closed, the higher part of the land : it lay as a great reef or sand-bank, partly hemming in a vast continental lagoon, where corals, encrinites and mollusks grew in profusion, thus separating more or less perfectly the already existing Atlantic from the interior waters.

IV. The oscillations or changes of level over the continent, through the Upper Silurian and Devonian, had some reference to this border region of the continent : the formations approach or recede from it, and sometimes pass it, according to the limits of the oscillations eastward or westward. Along the course of the border itself there were deep subsidences in slow progress,