

he adduces it in aid of the astronomical theory of glacial periods, has treated in so masterly a manner as really to give it the first place as an efficient cause. This is the varying distribution of ocean currents, in connection with the differences in the elevation and distribution of land. The great equatorial current, produced by the action of the solar heat on the atmosphere and the water, along with the earth's rotation, is thrown, by opposing continental shores, northward into the Atlantic and Pacific in the Gulf Stream and Japan current, giving us a hot-water apparatus which effectually raises the temperature of the whole northern hemisphere, and especially of the western sides of the continents. Mr. Croll imagines that if his astronomical causes could, to ever so small an extent, intensify the action of these currents or their determination to the north, we should have a period of warmth, while a similar advantage given to the southern hemisphere would produce a glacial age in the north. But this requires us to assume what ought to be proved; namely, that the position of aphelion and the increase or decrease of eccentricity would actually so swing the equatorial current to the north or south. It further requires us to assume—and this is the most important defect of the theory—that no change occurs in the distribution of land and water; because any important change of this kind might obviously exert a dominant influence on the currents. Let us take two examples in illustration of this.

At the present time the warm water thrown into the north Atlantic not only increases the temperature of its whole waters, but gives an exceptionally mild climate to western Europe. Still the countervailing influence of the arctic currents and the Greenland ice is sufficient to permit numerous icebergs to remain unmelted on the coast of Labrador and Newfoundland throughout the summer. Some of the bergs which creep down to the mouth of the Strait of Belle Isle, in the latitude of the south of England, actually remain unmelted till the snows of a succeeding winter fall upon them. Now let us suppose that a subsidence of land in tropical America were to allow the equatorial current to pass through into the Pacific. The effect would at once be to reduce the temperature of Norway and Britain to that of Greenland and Labrador at present, while the latter