

Recapitulation.—From this survey of the continents and oceans it follows :—

That, while there are many variations in the courses of the earth's feature-lines, there are two directions of *prevalent* trends,—the northwesterly and the northeasterly; that the Pacific and Atlantic have thereby their positions and forms, the islands of the oceans their systematic groupings, the continents their triangular and rectangular outlines, and the very physiognomy of the globe an accordance with some comprehensive law.

It has been observed, first by Professor R. Owen, of Indiana (1857), that the outlines of the continents lie in the direction of great circles of the sphere, which great circles are, in general, tangential to the arctic or antarctic circle. By placing the north pole of a globe at the elevation $23^{\circ} 28'$ (equal to the distance of the arctic circle from the pole or the tropical from the equator), and revolving the globe eastward, part of these continental outlines, on coming down to the horizon of the globe, will be found to coincide with it; and on revolving it westward, most of the other lines. Other great lines, as part of those of the Pacific, are pointed out as tangents to the tropical circles instead of the arctic. But there are other equally important lines which accord with neither of these two systems, and a diversity of exceptions when we compare the lines over the surfaces of the continents and oceans.

If the views of Mr. Owen are right, the direction of coast lines on the parallel of $66^{\circ} 32'$ north or south should be east and west (being tangent to the antarctic circle), and on the equator, about N. $23^{\circ} 28'$ E.; and the trend in other places intermediate between these extremes. And in the tropical part of the ocean, great circles tangent to the tropical circles would have the course N. $66^{\circ} 32'$ W. crossing the equator, but be E.-W. on the tropical circles; and between the two positions between N. $66^{\circ} 32'$ W. and E.-W. The map (see page 47) shows how far these are the actual courses.

IV. OCEANIC AND ATMOSPHERIC MOVEMENTS AND TEMPERATURE.

The earth has east-west differences, as already pointed out, in the depths of its oceans (page 19). But of greater importance are the east-west or front-and-rear contrasts which are a consequence of its diurnal revolution. Ordinary observation recognizes only the rising and setting of the sun, and day and night, as the chief consequences of the eastward rotation. But these are only the most obvious. The results are manifested universally in the climates of the globe, the winds, the tides, and oceanic currents, in the earth's magnetic currents, in the geological action of waters of the ocean and land, the distribution of plants and animals; and they give to the eastern and western sides of the continents, or the front and rear, differences which are profound in influence both physically and physiologically. The effects are diversified and extreme. They are moderated by the nutation of the earth's axis in its annual revolution, which gives the earth its winters and summers; but they are none the less real and fundamental. Ferrel obtained a mathematical expression for the relation of the rotation to the winds, and announced the fundamental law (1858) that "in whatever direction a body moves on the earth's surface, there is a force, arising from the