



A diagram showing the different horizons which may be seen from different elevations.

II. THE SHAPE AND SIZE OF THE EARTH

Materials of Which the Earth is Composed. The earth is a large globular mass of matter, the outer portion of which is what is known as rock. In the larger depressions of the rock surface there are great volumes of water, and over all is the air. The rocks, the water, the air, and all objects are held in their relative positions, because they are constantly drawn toward the centre of the earth by the force which we call gravity. The heavy rocks form the central mass, while the water, which is heavier than air, but lighter than rock, is drawn as near to the centre of the earth as the rock will allow it to go.

There is evidence that, as a result of great heat, the earth was once in a fused condition, and, as it cooled, what is known as the earth's crust was formed on the outside. This cooling process is still going on, but deep borings show that the temperature increases at such a rate that we are justified in believing that, at a depth of twenty-five or thirty miles, the heat would still be sufficient to melt any known substance. Volcanoes and hot springs also indicate great internal heat. It is probable, therefore, that the greater portion of the earth's interior, if not in a molten condition still, is in such a state that if the pressure were relieved it would at once become molten. In its various motions, however, the earth behaves as a solid ball, and Lord Kelvin gives his reasons for believing it to be as rigid as if it were made of solid steel.

Igneous or Unstratified Rocks. When the earth's surface first cooled, the rock material would be in a shapeless mass having a rough, glassy appearance. Of this nature are the

various kinds of granite, as well as the lava poured out on the surface or forced up in sheets between beds of other rocks. Rocks thus formed are known as *igneous* or *unstratified*, and most of them are very hard and dense.

Stratified Rocks. On the first appearance of a crust on the earth, only unstratified rocks would be formed, but as no rocks, however hard, can long withstand the action of heat, rain, air, etc., these rocks would soon begin to crumble and decay, forming vast quantities of powdered material. Some of this powdered material would form soil, while the remainder would be carried away by streams and rivers and deposited as layers of sediment in lakes or on the margins of oceans. In time, through the agency of pressure, heat, and chemical action, these layers or strata would become solidified and form what are known as *stratified rocks*. These rocks are very common and may be seen along the high banks of many lakes and rivers. They always show marks of bedding, the layers or strata having been laid down horizontally or nearly so. Fine muds form *shales*, sand forms *sandstone*, and gravel or pebbles form *conglomerate*. The stratified rocks also include rocks formed from the remains of animal or plant life; thus decayed vegetation forms *coal beds*, and the shells and skeletons of minute sea animals give rise to *chalk* and *limestone*.



Stratified Rock.

The fact, that the earth's crust is still continually rising in some places and sinking in others, explains why stratified rocks are often found high above water, notwithstanding the fact that they can be formed only under water.

Metamorphic or Changed Rocks. The character of both stratified and unstratified rocks may be changed by intense heat and pressure such as are present in great earth movements. In this way, granite becomes a rock called *gneiss*, which is very common in Northern Canada; the shale of stratified rocks becomes slate; sandstone becomes quartz; and limestone becomes marble. The bedding, though still evident, is disturbed and the strata are