

farther off than Neptune. Thus it appears that the earth is a very small object in the universe. Hence we naturally conclude that it is a dependent part of the solar system; that, as a satellite of the sun, in conjunction with other planets, it could no more have existed before the sun, or our planetary system before the universe of which it is a part, than the hand before the body which it obediently attends.

Although thus diminutive, the laws of the earth are the laws of the universe. One of the fundamental laws of matter is gravitation; and this we trace not only through our planetary system, but among the fixed stars, and thus *know* that one law pervades the universe.

The rays of light which come in from the remote limits of space are a visible declaration of unity; for this light depends on molecular vibrations, — that is, the ultimate constitution and mode of action of matter; and, by the identity of its principles or laws, whatever its source, it proves the essential identity of the molecules of matter.

Meteoric stones are specimens of celestial bodies occasionally reaching us from the heavens. They exemplify the same chemical and crystallographic laws as the rocks of the earth, and have afforded no new element or principle of any kind.

The moon presents to the telescope a surface covered with the craters of volcanoes, having forms that are well illustrated by some of the earth's volcanoes, although of immense size. The principles exemplified on the earth are but repeated in her satellite.

Thus, from gravitation, light, meteorites, and the earth's satellite, we learn that there is oneness of law through space. The elements may differ in different systems, but it is a difference such as exists among known elements, and even if exemplifying new laws, such laws cannot be at variance with those illustrated by nature within reach of terrestrial investigation. The universe, if open throughout to our explorations, would vastly expand our knowledge, and science might have a more beautiful superstructure, but its basement-laws would be the same. A treatise on Celestial Mechanics printed in our printing-offices would serve for the universe.

The earth, therefore, although but an atom in immensity, is immensity itself in its revelations of truth; and science, though gathered from one small sphere, is the deciphered law of all spheres.

It is well to have the mind deeply imbued with this thought, before entering upon the study of the earth. It gives grandeur to science and dignity to man, and will help the geologist to apprehend the loftier characteristics of the last of the geological ages.

Special aim of geology, and method of geological reasoning. — Geology is sometimes defined as the science of the structure of the earth. But the ideas of structure and *origin* of structure are inseparably connected, and in all geological investigations they go together. Geology had its very beginning and essence in the idea that rocks were made through secondary causes; and its great aim has ever been to study structure in order to com-