

through the knowledge of the conditions or agencies concerned in the phenomena of existing nature, that we must approach with caution to the solution of the similar problems offered by the phenomena of ancient times: the common relations are found by comparison of the analogous effects; but if the modern effects are merely known as laws of phenomena, and not reduced, to use Mr. Whewell's expressive language, to laws of causation, the corresponding phenomena of geology must remain equally unexplained.

The intelligent reader will easily see that it is not meant to convey the impression that nothing in older geology can be understood, unless there be known something exactly like it in modern nature; the laws of causation which regulate the phenomena now occurring on the globe, once correctly known, will certainly be recognised in a vast variety of older effects, in which the same agencies — however differently combined, — produced, or predominated so as to characterise, the result.

Thus the laws of chemical phenomena explain the production of the most ancient minerals, as well as of those daily produced before our eyes—the laws of physiology apply as well to the fossil flora, and the world of extinct animal life, as to the botanical and zoological enrichment of the actual land and sea: so also the laws of aggregation of sedimentary substances in water — of fused rocks and earthy matters — the laws of optical and calorific phenomena — these laws of action are limited in their application only by the circumstances of the case or of the experiment, independent of time, and exempt from change.

Geology thus presents itself in an aspect which may surprise those who have not studied the philosophy of the subject: though it gathers the most striking and beautiful facts, it depends for their interpretation entirely upon the progress of collateral science, and puts forth no speculation or hypothesis, except in conformity with the known laws of nature, and as a means of ex-