

At an early time in the earth's history, anterior to any of the periods of which a record remains in the visible rocks, the chief sources of geological energy probably lay within the earth itself. The planet still retained much of its initial heat, and in all likelihood was the theatre of great chemical changes. As it cooled, and as the superficial disturbances due to internal heat and chemical action became less marked, the influence of the sun, which must always have operated, and which in early geological times may have been more effective than it afterward became, would then stand out more clearly, giving rise to that wide circle of surface changes wherein variations of temperature and the circulation of air and water over the surface of the earth come into play.

In the pursuit of his inquiries into the past history and into the present economy of the earth, the student must needs keep his mind ever open to the reception of evidence for kinds, and especially for degrees, of action which he had not before encountered. Human experience has been too short to allow him to assume that all the causes and modes of geological change have been definitely ascertained. Besides the fact that both terrestrial and solar energy were once probably more intense than now, there may remain for future discovery evidence of former operations by heat, magnetism, chemical change, or other agency, that may explain phenomena with which geology has to deal. Of the influences, so many and profound, which the sun exerts upon our planet, we can as yet only perceive a little. Nor can we tell what other cosmical influences may have lent their aid in the revolutions of geology.

In the present state of knowledge, all the geological energy upon and within the earth must ultimately be traced