

periods of the earth's history by means of an ordered array of extinct fossil forms.

*Hypotheses of the Earth's Origin and History, and Beginnings of Geological Observation.*—The keen interest in minerals and fossils and the flourishing condition of the mining industry gradually attracted the attention of scientific men to the investigation of the earth itself. Two methods of research, the empirical and the speculative, developed alongside one another. The one had for its immediate aim the determination of facts, and in its further outlook, the possible construction of some suitable theory; the other contented itself with a minimum of observation, accepted the risks of error, and set about explaining the past and the present from the subjective standpoint. This latter method naturally attained no higher results than the geogenetic fantasies of classical antiquity. And it certainly could never have gathered sufficient energy to roll aside the mass of philosophical and doctrinal tradition that blocked the path of progress.

Throughout the later and Middle Ages, water and fire still continued to be accepted as the two essential active and formative forces dominating the earth's configuration, hence it was unavoidable that the conceptions of the ancient philosophers should re-appear again and again in the newer theories, if in renovated form. Meantime there were in every land of Europe empiricists who were patiently contributing new data to the knowledge of chemistry, of physics, and the constitution of the earth's crust, and were thus preparing the only possible foundation of a science of geology.

Leonardo da Vinci deserves an honoured place amongst the founders of geology, as one of the first who investigated the earth's structure upon scientific principles. Not only did Da Vinci recognise the true origin of fossils, but his artistic sense of form and his close observation of nature revealed to him in the North Italian valleys the agency of running water in sculpturing the earth's surface. He showed how rivers erode their valleys, and deposit pebbles on valley terraces; how a fine detritus accumulates at river mouths, and plants and animals are buried in it; how the organic remains then pass through physical changes and become petrified while the river mud hardens into solid rock, and finally the rock