

thickness. It is true we have no means of exploration in the earth's interior, but the conjoined labours of physicists have now proceeded sufficiently far to throw much inferential light on the subject, and to enable us to make some general affirmations with certainty; and these it is the more necessary to state distinctly, since they are often treated as mere subjects of speculation and fruitless discussion.

(1) Since the dawn of geological science, it has been evident that the crust on which we live must be supported on a plastic or partially liquid mass of heated rock, approximately uniform in quality under the whole of its area. This is a legitimate conclusion from the wide distribution of volcanic phenomena, and from the fact that the ejections of volcanoes, while locally of various kinds, are similar in every part of the world. It led to the old idea of a fluid interior of the earth, but this seems now generally abandoned, and this interior heated and plastic layer is regarded as merely an under-crust, resting on a solid nucleus.<sup>1</sup>

(2) We have reason to believe, as the result of astronomical investigations,<sup>2</sup> that, notwithstanding the plasticity or liquidity of the under-crust, the mass of the earth—its nucleus as we may call it—is practically solid and of great density and hardness. Thus we have the apparent paradox of a solid yet fluid earth; solid in its astronomical relations, liquid or

<sup>1</sup> I do not propose to express any definite opinion as to this question, as either conclusion will satisfy the demands of geology. It would seem, however, that astronomers now admit a slight periodical deformation of the crust. See Lord Kelvin's Anniversary Address to Royal Society, 1892.

<sup>2</sup> Hopkins, Mallet, Lord Kelvin, and Prof. G. H. Darwin maintain the solidity and rigidity of the earth on astronomical grounds; but different conclusions have been reached by Fisher, Hennesey, Delaunay, and Airy. In America, Hunt, Barnard and Crosby, Dutton, Le Conte and Wadsworth have discussed these questions. Bonney has suggested that a mass may be slowly mobile under long-continued pressure, while rigid with reference to more sudden movements.