

earth, the crushing in of which will give rise to earthquakes. There appears reason to believe that the most convulsive earthquakes originate under the sea, as in the cases of the great Lisbon earthquake and those of Peru, Chile, and Japan. For these it is as yet difficult to imagine an adequate cause. Prof. Milne believes that they may be partly due to disturbances of the nature of volcanic explosions, because they originate beneath the sea, and the vibrations have the peculiar rapid inward motion characteristic of the discharge of an explosive like dynamite.<sup>188</sup>

An obvious source of disturbance within the earth is the rupture of rocks within the crust under the intense strain produced by subsidence upon the more rapidly contracting inner hot nucleus. This cause may conceivably affect mountainous areas; but we do not know how it would affect the sea-floor. In mountainous districts, many different degrees of shock, from mere tremors up to important earthquakes, have been observed, and these are not improbably due to sudden more or less extensive fractures of rocks still under great strain.<sup>189</sup> Hoernes, from a study of European earthquake phenomena, concludes that though some minor earth-tremors may be due to the collapse of underground caverns, and others of local character to volcanic action, the greatest and most important earthquakes are the immediate consequences of the formation of mountains, and he connects the lines followed by earthquakes with the structural lines of mountain-axes.<sup>190</sup>

From what was stated at the beginning of the present section, it is evident that where the earth's crust in any region

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<sup>188</sup> "Earthquakes," p. 281.

<sup>189</sup> See postea, p. 530. Suess, "Entstehung der Alpen," Vienna, 1875.

<sup>190</sup> "Erdbeben Studien," Jahrb. Geol. Reichs. xxviii. (1878), p. 448.