

admitted that certain broad distinctions between the older and the later eruptive rocks have been well ascertained, and appear to hold generally over the world. Among these distinctions may be mentioned as more characteristic of the Palæozoic rocks the presence of microcline, turbid orthoclase in Carlsbad twins, muscovite, enstatite, bronzite, diallage, tourmaline, anatase, rutile, cordierite, and in the younger rocks the presence of sanidine, tridymite, leucite, nosean, hauyne, and zeolites. Even where the same mineral occurs in both the older and newer series, it often presents a somewhat different aspect in each, as in the case of the plagioclase and augite, which in the younger series are distinguished by the occurrence in them of vitreous and gaseous inclusions which are rare or absent in those of the older series.<sup>108</sup> Throughout the younger eruptive rocks, the vitreous condition is much more frequent and perfectly developed than in the older group, where, on the other hand, the granitic structure is characteristically displayed. Still, to these rules so many exceptions occur that it may be doubted whether enough of positively ascertained data have been collected regarding the relative ages of eruptive rocks to warrant the adoption of any classification upon a chronological basis. There can be no doubt that, making due allowance for the alterations arising from permeation by meteoric water, there is no essential difference between some types of volcanic rock in Palæozoic and in recent times. The Carboniferous basalts and trachytes of Scotland, for example, present the closest resemblance to those of Tertiary age.<sup>109</sup>

Though no classification which can at present be pro-

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<sup>108</sup> See J. Murray and A. Renard, *Proc. Roy. Soc. Edin.* xi. p. 669.

<sup>109</sup> See *Nature*, iii. (1871), p. 308.