

Some of the most perfect examples of superinduced prisms may occasionally be noticed in seams of coal which have been invaded by intrusive igneous rocks. In the Scottish coal-fields, sheets of basalt have been forced along the surfaces of coal-seams, and even along their centre, so as to form a bed or sheet in the middle of the coal-seam. The coal in these cases is sometimes beautifully columnar, its slender hexagonal and pentagonal prisms, like rows of stout pencils, diverging from the surface of the intrusive sheet.⁷

Other examples of the production of this structure have been described in dolomite altered by quartz-porphry (Campeglia, Tuscany); fresh-water limestone altered by basalt (Gergovia, Auvergne); basalt-tuff and granite altered by basalt⁸ (Mt. Saint-Michel, Le Puy).

Calcination, Melting, Coking.⁹—By the great heat of erupted masses, more especially of basalt and its allies, rocks have been calcined and partially or completely melted. In some, the matrix or some of the component minerals have been melted; in others, the whole rock has been fused. Among granite fragments ejected with the slags of old volcanic vents in Auvergne, some present no trace of alteration, others are burned as if they had been in a furnace, or are partially melted so as to look like slags, each of their component minerals, however, remaining distinct. In the

Büdingen, Upper Hesse, Schöberle, near Kriebitz, Bohemia; Johnsdorf, near Zittau, Saxony (the Quader-sandstone of Gorischstein, in Saxon Switzerland, is beautifully columnar; W. Keeping, *Geol. Mag.* 1879, p. 437); Bishopbriggs, near Glasgow.

⁷ Coal and lignite, with their accompanying clays, altered by basalt, diabase, melaphyre, etc., Ayrshire, Scotland; St. Saturnin, Auvergne; Meissner, Hesse Cassel; Ettingshausen, Vogelsgebirge; Sulzbach, Upper Palatinate of Bavaria; Fünfkirchen, Hungary: by trachyte, Commeny, Central France; by phonolite, Northern Bavaria.

⁸ Naumann, "Geognosie," i. p. 737.

⁹ It is worthy of observation that changes of the kind here referred to occur most commonly with basalt-rocks, melaphyres and diabases. Trachyte has been a less frequent agent of alteration, though some remarkable examples of its influence have been noted. Poulett Scrope (*Geol. Trans.* 2d ser. ii.) describes the alteration of a trachyte conglomerate by trachyte into a vitreous mass. Quartz-porphry and diorite occasionally present examples of calcination, or more or less complete fusion. But with the granitic and syenitic rocks changes of this kind have never been observed. Naumann, "Geognosie," i. p. 744.