

trate like a veritable trap into fissures in the quartzite and gneiss. A rock of sedimentary origin may then assume the conditions of a so-called igneous rock, and who shall say that any of the intrusive granites, dolerites, euphotides, and serpentines, have an origin distinct from the metamorphic strata of the same kind, which make up such vast portions of the older stratified formation? To suppose that each of these sedimentary rocks has also its representative among the ejected products of the central fire, seems a hypothesis not only unnecessary, but when we consider their varying composition, untenable.

We are next led to consider the nature of the agencies which have produced this plastic condition in various crystalline rocks. Certain facts, such as the presence of graphite in contact with carbonate of lime, and oxyd of iron, not less than the presence of alkaliferous silicates, like the feldspars in crystalline limestones, forbid us to admit the ordinary notion of the intervention of an intense heat, such as would produce an igneous fusion, and lead us to consider the view first put forward by Poulett Scrope, \* and since ably advocated by Scheerer and by Elie de Beaumont, of the intervention of water aided by fire, which they suppose may communicate a plasticity to rocks at a temperature far below that required for their igneous fusion. The presence of water in the lavas of modern volcanos led Mr. Scrope to speculate upon the effect which a small portion of this element might exert at an elevated temperature and under pressure, in giving liquidity to masses of rock, and he extended this idea from proper volcanic rocks to granites.

Scheerer in his inquiry into the origin of granite has appealed to the evidence afforded us by the structure of this rock, that the more fusible feldspars and mica crystallized before the almost infusible quartz. He also points to the existence in granite of what he has called pyrogenomic minerals, such as allanite and gadolinite, which, when heated to low redness, undergo a peculiar and permanent molecular change, accompanied by an augmentation in density, and a change in chemical properties, a phenomenon completely analogous to that offered by titanate of iron and chromic oxyd in their change by ignition from a soluble to an insoluble condition. These facts seem to exclude the idea of igneous fusion, and point to some other cause of liquidity. The presence of natrolite as an integral part of the zircon-syenites of Norway, and of talc and chlorite and other hydrous minerals in many granites show that water was not excluded from the original granitic paste.

Scheerer appeals to the influence of small portions of carbon and

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\* See Journal of Geol. Society of London, vol. xii., p. 326.