

associations, as well as the position with reference to distance from coasts, there is an excellent means of forming an opinion relative to the origin of the mineral particles that may be met with in deep-sea deposits. On pp. 19-23 we have indicated the properties most easily observed in free mineral particles, in the form of more or less perfect crystals or irregular splinters, that may serve to determine the species. It remains here to point out some special characters of volcanic minerals, which permit us to distinguish them from minerals of continental origin. Under each species, arranged alphabetically, are given the distinctive peculiarities on which we have relied in determining the species as having come from recent eruptions.

AMPHIBOLE, *Basaltic hornblende*, fragments of well-crystallised individuals, sometimes regularly-bounded crystals coated with volcanic glass, generally compact, no fibrous structure, well-marked cleavage, high lustre on the planes of cleavage, black by reflected light, brown or reddish brown by transmitted light, strong pleochroism and absorption, zonary structure, numerous vitreous and gaseous inclusions, coating of magnetite and characteristic corrosion. **FELSPARS**, (a) *Monoclinic, Sanidine*, often in crystals, with glassy habit, colourless and transparent, tabular parallel to M, or elongated parallel to the edge P/M, separation-planes parallel to the orthopinakoid, numerous gas and vitreous inclusions often crowded together in the same crystal, having sometimes geometrical outlines, and often regularly disposed in the interior of the crystal, often covered by or imbedded in a glassy coating. (b) *Triclinic, Plagioclase*, glassy habit, transparent, few decomposition products, crystals in the form of thin rhombic tables parallel to M, gaseous and vitreous inclusions. *Olivine*, regularly-formed crystals coated with volcanic glass or palagonite, often skeleton crystals, inclusions of vitreous particles, rarely decomposed into serpentinous matter, often reddish by decomposition of ferric oxide. **PYROXENE**, (a) *Rhombic, Hypersthene*, reddish or brownish fragments, or bounded by cleavage planes, or vaguely-outlined crystals, prismatic, intergrowth with monoclinic pyroxene. *Bronzite*, glass inclusions, no intergrowth with monoclinic pyroxene. (b) *Monoclinic, Augite*, often regularly-formed crystals, or fragments coated with volcanic glass, fresh, rarely decomposed into chloritic substance or into uralite, frequent glass inclusions. **Quartz**.—In exceptional instances quartz was observed as small crystals bounded by the planes of the hexagonal prism and pyramid; these may have been derived from liparitic ashes, or from the disintegration of liparitic rock fragments. In other cases a few quartz grains containing glass inclusions were observed, hence in all probability of volcanic origin.

It is evident that the distinctive characters given above are especially in relation with the less advanced degree of decomposition, which is itself a consequence of their recent eruptive origin. These characters have never been used exclusively, but always in conjunction with the mineral associations and positions in the deposits. There are other mineral particles in the sediments, which, in the free state, do not offer any distinctive