

consideration of the external form, internal structure, and distribution of the magnetic spherules which have just been described. This conclusion is further confirmed by the fact that these spherules do not present any analogies with terrestrial bodies which, up to the present time, have been found in sedimentary or igneous rocks, while, as stated above, they present striking analogies with meteoric bodies, known with certainty to have fallen from extra-terrestrial space.

The question of cosmic dusts has been discussed by Nordenskjöld,¹ Daubrée,² Tissandier,³ and Meunier,⁴ and these, together with other scientific men, have presented numerous facts in support of the cosmic origin of certain metallic particles or silicates collected as atmospheric precipitations. It has been urged, however, with great justice, against the extra-terrestrial origin of certain reputed cosmic dusts, that they are constituted, from a mineralogical point of view, of the same mineral species as those forming the rocks appearing at the surface in the neighbourhood of the regions from which the dusts were collected.

With reference to the particles of magnetic iron very often met with in atmospheric precipitations, which have sometimes been considered of cosmic origin, it may be pointed out that these, in all probability, have been derived from some telluric source; especially is this the case when they are of irregular form, without a black coating, unaccompanied by silicates of a spherical form, and associated with organic or inorganic products derived from our soils. It may also be pointed out that many of these so-called cosmic dusts differ widely from each other in their chemical and mineralogical composition, which in itself points to a terrestrial rather than an extra-terrestrial origin.

Although native iron is extremely rare in terrestrial rocks, careful researches have shown that native iron, even cobaltiferous or nickeliferous, is present in terrestrial rocks, for instance, in the basaltic rocks of Ireland and Iceland.⁵ In this particular case it may

¹ The dust collected in Greenland in 1870 by Nordenskjöld, and believed by him to be of cosmic origin (Kryokonit), has been examined by von Lasaulx (*Min. u. petr. Mittheilungen von Tschermak.*, Bd. iii. p. 517, 1881), who came to the conclusion that the mineral particles in question were of telluric origin. The specimens collected by Nordenskjöld in his second journey in 1883 were examined by Wülfing (*Neues Jahrb. für Min., etc.*, Beilageband vii. p. 152, 1890). According to Wülfing the greatest part of the dust is composed of terrestrial minerals and organic matter, but he found some rare magnetic spherules, 0.1 to 0.2 mm. in diameter, of an opaque or transparent substance, which is in some cases isotropic, and in others birefringent; he refers them to chondres. Wülfing did not find spherules with metallic nuclei in the dust he examined.

² In a paper just published, Daubrée (*Comptes Rendus*, tom. cxi. and cxii., 1890-1891), alluding to the cosmic spherules of the deep-sea deposits, expresses the opinion that they may be of volcanic origin, having been formed and projected by the gaseous explosions. But, so far as we know, such spherules as those described are not found in volcanic ashes.

³ G. Tissandier, *Comptes Rendus*, tom. lxxxi. p. 576, 1875; tom. lxxxiii. p. 76, 1876.

⁴ In their paper: "Présence de sphérules magnétiques analogues à ceux des poussières atmosphériques, dans des roches appartenant à d'anciennes périodes géologiques" (*Comptes Rendus*, tom. lxxxvi. p. 450, 1878), St. Meunier and Tissandier describe some magnetic spherules dredged in deposits on the coasts of Tunis and Algeria and of Possession Bay, or contained in strata of Cretaceous, Liassic, and Triassic age, also in rocks of the carboniferous or Devonian formation. But it appears from their description that all the spherules collected in these various conditions seem to be hollow spherules with a neck.

⁵ See Andrews, *Brit. Ass. Report* for 1852, pp. 34-35.