VI.—*On a new Manganesian Garnet.*

By Professor M. F. Heddle.

IN the course of an examination of such Scottish garnets as were pure enough for analysis, I found that four had a composition which was very similar, but which differed from that of any known, and that to an extent entitling them to be regarded as constituting a well-marked variety.

These garnets, from their purity of colour and transparency, would all be classed as *precious garnets*—they are, indeed, the most brilliantly coloured which the northern portion of the kingdom affords.

They all occur in granite. The first, which was the finest, was found imbedded in quartz, in a granitic belt of the gneiss through which the railway is cut in Glen Skiag in Rosshire.

The associated minerals are large crystals of muscovite, black and green tourmaline, zircon rarely, apatite very rarely.

The garnets occur of two very distinct appearances, though their composition is similar.

The crystals are all leucitic; those up to the size of an inch in diameter have the colour of red currant jelly, and these sometimes contain minute crystals of zircon in their interior.

The larger crystals, which are several inches in diameter, are of a brownish-red tint. Both are much flawed.

The specific gravity of the light-red crystals is 4·125.
They yielded

Silica	35·99
Alumina	16·221
Ferric Oxide..	8·638
Ferrous Oxide	23·27
Manganous Oxide ..	15·24
Lime	·403
Magnesia	·471
Water	·249
	100·482

Of the brownish variety, a portion of a crystal over five inches in diameter yielded

Silica	36·076
Alumina	18·957
Ferric Oxide	7·033
Ferrous Oxide	21·56
Manganous Oxide ..	13·615
Lime	·904
Magnesia	1·769
Water	·325
	100·239

The second locality—much in the same line of strike as that of the belt which carried the above—is a quarry half a mile south of Struay Bridge, in Rosshire.

The granitic belt here is more felspathic than quartzose; the felspar being of two colours—blue and pink. The associates are pale-green mica, black tourmaline, and minute brown zircons.

The garnets are of all sizes, up to an inch, of the leucite form, and bright red. They are somewhat opaque, and much flawed.

Their composition is,

Silica	35·695
Alumina	15·804
Ferric Oxide	21·084
Ferrous Oxide	14·941
Manganous Oxide ..	11·426
Lime	1·116
Water	·06
	100·09

The last locality is the ridge called Ben Resipol in Argyllshire.

They occur sparsely wherever granite is seen. Those analysed were got in a granitic belt of some six to eight feet in thickness, this was formed of milky felspar, with little quartz or mica; the belt stretches across the saddle of the hill, and falls over its north-east shoulder, about 300 feet from the summit. The garnets are small in size, but of a fine red colour, and being less fissured than usual they might be used for purposes of jewellery.

Their composition is,—

Silica	36·846
Alumina	21·237
Ferric Oxide	7·381
Ferrous Oxide	18·378
Manganous Oxide ..	14·461
Lime	·775
Magnesia	·846
	99·924

Possibly all these garnets contained a trifling admixture of quartz The manganese, probably, has some effect in exalting the brilliancy o their colour.

The average composition of these garnets is,—

		Oxygen.		
Silica	36·14	19·27		19·27
Alumina.. ..	18·05	8·41	11·12	
Ferric Oxide ..	9·04	2·71		
Ferrous Oxide	21·35	4·74		19·54
Manganous Oxide	13·69	3·09		
Lime	·77	·22	8·42	
Magnesia ..	·55	·22		
Water	·16	·15		

Here the alumina is to the ferric oxide as 3 to 1, and the ferrous oxide to the manganous oxide as 3 to 2.

The protoxides do not balance the sesquioxides well, but the formula may be written generally thus,— $(\dot{Fe}^3, \dot{Mn}^2)^2\ddot{Si}^3 + (\ddot{Al}_2{}^3, \ddot{Fe}_2)_2\ddot{Si}^3$.

No garnet yielding even approximately such a proportion of manganese has been noticed; the nearest approach thereto being the *manganesian garnet* of America, Miask, &c., the formula of which is $(Fe, \dot{Mn}^2)^2\ddot{Si}'^3 + \ddot{Al}_2{}^2\ddot{Si}^3$.

In this the proportion of manganese is about 32 per cent., and in contradistinction to it this Scotch variety may be termed a *manganesious garnet.*