X.—*List of Japanese Minerals, with Notes on Species which are believed to be New.*

By John Milne, Yedo, Japan.

DURING the last three years I have been engaged in collecting and cataloguing the minerals of Japan. The following is a list of the species with which I am acquainted. The arrangement is according to the classification given by Dana in his System of Mineralogy.

1. Native Gold
* 2. Native Silver
* 3. Native Copper
* 4. Meteorite (?) two, one from the Bonin Islands, the other from Idzu
5. Amalgam
6. Arsenic ?
7. NATIVE SULPHUR
8. Graphite
9. Realgar
10. Orpiment
11. Antimonite
12. Molybdenite
13. Argentite
14. GALENITE
15. Bornite
16. Sphalerite
17. Cinnabar
*18. Pyrrhotite
19. PYRITE
20. CHALCOPYRITE
21. Mispickel
*22. Tetrahedrite
23. Halite
24. Fluorite ?
25. Hematite
26. Clay Iron Stone
27. MAGNETITE
*28. Chromite
29. Cassiterite
*30. Rutile
31. Pyrolusite
32. Limonite
*33. Psilomelane
34. QUARTZ (rock crystal, amethyst, false topaz, catseye, chalcedony, agate, jasper, flint
35. Opal
36. Wollastonite ?
37. Augite
*38. Spodumene ?
*39. Rhodonite
40. Hornblende, asbestus, &c.
41. Olivine
42. Garnet
43. Epidote
44. Hisingerite ?
45. Vermiculite ?
46. Muscovite
47. Orthoclase—glassy felspar, obsidian, pumice, pitchstone, &c.
48. Tourmaline
49. Topaz
50. Chrysocolla
*51. Analcime
52. Talc (Steatite, &c.)
*53. Meerschaum
54. SERPENTINE

55. Kaolinite
56. Chlorite
*57. Vivianite?
58. Turquois?
59. Nitre
60. Barite
*61. Anhydrite
62. Gypsum
*63. Chalcanthite
64. Melanterite
65. Alum
66. Alunite?
67. CALCITE (Chalk, &c.)
*68. Dolomite
*69. Aragonite
70. Diallogite
*71. Cerusite
72. Malachite
*73. Azurite
74. Cobalt Ore
75. AMBER
COAL (anthracite, bituminous, lignite, peat, &c.)
*76. Asphalt
*77. PETROLEUM.

Those marked with an asterisk are rare, and I have not yet been able to obtain specimens of them. Doubtful species are followed by a note of interrogation. Names printed in large type indicate common species. Of these latter I have had opportunity of examining many hundreds of specimens. The list has been chiefly compiled from the following sources.

1st. From information gained whilst travelling in various parts of the country (Nipon, Shikoku, Yezo, and the Kuriles.)

2nd. From the extensive collection of minerals placed in my charge by the Mining Department.

3rd. From the large collection of Minerals exhibited at the National Exhibition of Japan, held in Yedo, 1877.

4th. From the collection of minerals exhibited at the exhibition of Kioto, in 1878.

In looking over the above list of minerals the reader cannot fail to observe the absence of many important groups of minerals. Thus, in a country like Japan where the prevailing rocks are of volcanic origin, one would naturally expect to meet with some of the Zeolites. Up to the present I have not been able to meet with any of them, and if they exist at all they are probably extremely rare.

Amongst the metallic minerals a paucity of species will also be observed, a fact which is the more remarkable when we consider the vast number of mines which are being worked. An explanation for this might be that the miners only paid attention to those minerals which were of commercial value. From what I have seen the more probable explanation is that the mines do not yield any variety of ore.

Specimens Nos. 24, 36, 44, 45 are probably new varieties of old species, if not altogether new.

No. 45. (Vermiculite)? Occurs in short six-sided prisms usually about 6^{mm} long and 3 to 4^{mm} broad. These are made up of a number of laminæ united together at right angles to the length of the prism. The surfaces of these prisms are too irregular to admit of any measurements being made upon them. In order to obtain measurements I took laminæ obtained by cleavage, and after covering them with ink obtained an impression upon paper. The profiles thus obtained were extended by carefully ruled lines, the angles between which gave the angles of the prism.

In three cases the opposite angles of the hexagon were as follows :—

1st ... $\left\{\begin{matrix}127° 30' \\ 123° 30'\end{matrix}\right\}$ mean 125° 30' $\left\{\begin{matrix}114° \\ 119°\end{matrix}\right\}$ mean 115° 30' $\left\{\begin{matrix}118° \\ 116°\end{matrix}\right\}$ mean 117° 15'

2nd ... $\left\{\begin{matrix}126° \\ 130°\end{matrix}\right\}$ mean 128° $\left\{\begin{matrix}116° \\ 115° 30'\end{matrix}\right\}$ mean 115° 45' $\left\{\begin{matrix}120° \\ 111°\end{matrix}\right\}$ mean 115° 30'

3rd ... $\left\{\begin{matrix}124° \\ 121° 30'\end{matrix}\right\}$ mean 127° 45' $\left\{\begin{matrix}119° \\ 118° 30'\end{matrix}\right\}$ mean 118° 45' $\left\{\begin{matrix}116° \\ 119° 30'\end{matrix}\right\}$ mean 118°

From these rough measurements it would apparently seem that this mineral is rhombic, the prisms shewing a combination of a basal pinacoid, a prism, and a brachy or macro-pinacoid.

Although I made several sections of this mineral I could only obtain a brownish-red translucent leaf, which gave no distinguishing optical characteristics. From a partial analysis furnished me by Mr. J. H. Collins, it loses 6·41 p.c. of its weight on ignition. In this respect, in some of its blowpipe reactions and in some of its physical appearances, it resembles a Biotite.

It cleaves parallel to the basal pinacoid.

The cleavage surfaces thus obtained have a blackish-green to brown colour, and a brilliant but slightly pearly lustre. The streak is yellowish-brown. Externally the faces of the crystals are covered with an adherent film of ochreous matter.

H. about 1·5; G. about 2·7; fusibility above 5. With nitric and sulphuric acid it dissolves slowly, leaving a residue of silica. With hydrochloric acid it dissolves more quickly, giving a solution changing from brown to green and a residue of silica. When strongly heated either on charcoal or by means of the blowpipe it rapidly expands longitudinally to 6 or even 12 times its original length, at the same time twisting and writhing very like a Pharoah's Serpent. After having been thus heated it breaks up easily into metallic-looking golden scales.

It occurs near Tsurasee on the Kofu side of the Sasango Pass, in the beds of streams running down from granite hills, where it is collected by the inhabitants and sold for medicine, being first burnt before being administered.

From the odd way in which it writhes upon charcoal it is used by the inhabitants of the neighbourhood as a source of amusement, and it is often shewn to passing travellers, (especially on wet afternoons when time hangs heavily) as a local wonder.

No. 24. Fluorite, var. Chlorophane. This occurs massive. It is of a light-green colour and has a vitreous lustre.

Hardness *about* 4.

Specific gravity in one specimen 3·16, in another 3·13.

With hydrochloric acid or nitric acid when cold there was no change, but with sulphuric acid there was an evolution of gas. When heated with this latter acid it gave much white froth.

On heated platinum it shews a most striking phosphorescence not unlike burning sulphur.

It cleaves readily parallel to the faces of an octahedron, the angles as measured by a hand goniometer being 108° and 71°.

It occurs at the silver mine of Ikuno in Tajima associated with a white mica (Gilbertite ?) quartz and iron pyrites.

It is also found at Hakui in Noto, and at Inabegori in Ise. Some from this latter locality is white and some slightly purplish.

No. 44. Hisingerite ? This is an amorphous black mineral with an external black lustre. Owing to numerous fissures by which it is penetrated, it is very friable.

Streak, greyish-green. Hardness, 2·5—3. Specific gravity, 3·1. Fusibility about 5. With hydrochloric acid it gives a green solution and gas is disengaged slowly. By heat the solution becomes orange-yellow, and with the exception of a flocculent precipitate all is dissolved.

I am indebted to J. H. Collins, Esq., F.G.S., for an analysis of this mineral. He obtained from the mass—silica, 31·35 ; protoxide of iron, 41·76 ; peroxides of iron and alumina, very little ; magnesia, 5·08 ; and water, 7·24 ; but small selected fragments gave,—

Silica	24·5
Protoxide of iron	61·0
Peroxide of iron	3·2
Water	9·8
	98·5

with traces of manganous oxide, lime, magnesia, alumina and potash. Its physical characters so much resemble those of Hisingerite that I propose to refer it to this species, notwithstanding its apparent difference in chemi-

cal composition, which may be due to the difficulty in separating it sufficiently pure.

It occurs at the iron mine of Nakaosaka, where it is seen running in irregular veins through deposits of magnetite.

No. 36. Wollastonite? This is a massive pure white mineral with an internal fibrous structure, the fibres radiating somewhat irregularly from various centres.

Specific gravity, 2·82. Is infusible. With hydro-chloric acid a slightly yellowish-green solution is obtained, but with other acids it is unchanged.

From an analysis made by Mr. Tekichi, furnished to me by Dr. Divers, its composition is as follows:—

Calcium Oxide	48·07
Silica	51·63
Iron Oxide	a trace.
Alumina	a slight trace.
Magnesia	absent.
Water	absent.
	99·70

The formula is therefore CaO, SiO_2.