V.—*Notes on some Norwegian Minerals.*—By T. A. Readwin, F.G.S., &c.

THE Silver-mines, near Kongsberg, in Norway, are said to have been worked unceasingly for the last 200 years or more.

On June 6th, last, I was fortunate in being allowed to visit these celebrated mines, and also the silver-works at Kongsberg. More fortunate still, in obtaining the present beautiful specimens* of native silver and Argentite. They had very recently been taken from the mines, and I was told that my visit was opportune, because such specimens were not of every day occurrence. Be this, as it may, they are of especial interest just now, as illustrating the theory of "metal-growth," and the more particularly so, as two of them have most obligingly, since they came into my possession, thrown out sundry hints of bodily activity. In fact, have "grown"; and, as they have a direct bearing upon a previous paper, I propose to describe them as well as I can.†

Here are nine specimens, marked 2, 6, 10, 11, 13, 14, 18, 94, and 123.

Specimen 13 is silver-sulphide (Argentite), embedded in, and projecting from pure white calcite, which is built up chiefly of fundamental rhombohedrons of vitreous lustre and easy cleavage. A portion of the calcite is massive, and without lustre.

Upon the surface of the Calcite are numerous small specks of fantastically-shaped argentite, from two of which (*a* and *b*), silver has begun to extrude, or grow.

A pervading internal gray color, seen through portions of the calcite, may indicate some latent argentite in the specimen.

* These specimens were sent to the meeting at Plymouth for examination, but did not arrive in time.

† The descriptions are mostly unintelligible without the specimens, they have therefore been abridged.

The projecting argentite ($1\frac{1}{2} \times \frac{1}{2} \times \frac{3}{4}$ inch), it is difficult to describe. It is nearly covered with a thin, opaque, asbestos-like, milk-white film, which very easily peels off. This film, or overcoating will not effervesce with the acids. It is colored yellow thereby, but is not destroyed.*

The *chief* mass of argentite is a bundle of inter-lacing, intercurling, and conjoining exudations, more or less recent; and none of them, perhaps, of remote origin.

In places, where the coating has been removed, the argentite is of a brilliant gray metallic lustre, and is, for the most part, amorphous.

A small "growth," *only a month old* (near index f), is *singularly pendulous*, and is extremely sensitive to the slightest *vertical* movement of the specimen. [Mem., 7 July]. [Mem., Oct. 26]. The pendulous extrusion has since grown off.

Two small silver-exudations have since appeared out of the film-covered argentite, as well as several very delicate purely argentite growths in the cavities. [Mem., 7 Aug.]

Specimen 10 is Argentite in pure white Calcite. This specimen exhibits no fundamental rhombohedral form of calcite; but there are several small hexagonal prisms in one cavity, and exquisite modified scalene dodecahedral forms in another.

The prominent amorphous mass of thi isnteresting sulphide ($\frac{3}{4} + \frac{1}{2} + \frac{3}{4}$ inch) was completely covered with the opaque white coating, until I peeled off a portion of it, to test with acids, and left it of a brightly-shining gray color, without any appearance of growth.

No perceptible alteration to this date. [Mem., 7 Aug.]

Specimen 11. Argentite in pure white calcite, showing modified scalene dodecahedral crystals. There are several specks of argentite in the calcite. One of them marked *a* has the appearance of recent "growth." "Silver-growth" has commenced in the largest, *b*.

There is a small "silver-growth" at *c* unassociated with the ulphide.

No perceptible change to this date except a tiny silver-growth out of argentite, at *e*. [Mem. 7 Aug.]

Specimen 14 is a mass of argentite in white calcite, some of which is lamellar.

* This remarkable film, a portion of which Mr. Readwin kindly gave me, infusible in a gas flame, but slightly fusible before the blowpipe.—J.H.C.

In a druse, partly lined with modified scalene dodecahedral crystals, is argentite partly bright, and partly covered with the thin white coating. Here are no argentite-growths, proper, but a dozen or so of silver-growths have emanated therefrom, all having a reddish tarnish. These growths are all more or less crooked and twisted. Nearly all are turned up at the extreme point, and have a tendency to unite. Some of them appear *unions of exudations*, like some of the results of the experiments of Percy, Liversidge, Hutchings, and others, upon argentite at *low degrees of heat.*

No further alteration to date. [Mem., 7 Aug.]

Specimen 2 exhibits a bundle of more or less tarnished, fluted, and crooked silver "growths" in crystallized white calcite. There is no appearance of argentite, except a few minute specks.

The heavy weight of this specimen makes it probable that it contains a good deal of secreted argentite or silver. [Mem., 7 July.]

No further change to this date except a few instances of silver-fibre-extrusions, which look as if peeling off. [Mem. 7 Aug.]

No. 6 is a remarkably interesting specimen of argentite and silver "growths" out of amorphous pistacite-epidote, containing some crystallized white calcite.

The argentite "growths" are chiefly in the epidote; the silver "growths" chiefly in the calcite.

A silver-growth has *penetrated* into a fundamental rhombohedral calcite-crystal, and forced it up $\frac{1}{8}$ inch in its growth. This apparent hole-boring is extremely singular. [Mem., 7 July.] [Mem., Oct. 26]. This crystal has become detached.

No further change observable at this date. [Mem. 7 Aug.]

No 18 is a beautiful specimen of amorphous argentite in white calcite.

At one extremity of the argentite a shepherd's crook-like silver-growth has shot up, curved round, and taken another bend at its extreme end.

This growth, slightly tarnished, is double the length of the accompanying argentite. At its base, it is quite as wide. The growth has all the appearance of a "*union of fine filaments.*"

There are specks of argentite at one edge of the specimen, and some small silver-growths out of both argentite and calcite. [Mem. 7 July.]

No further alteration except some silver-filaments, which are, apparently peeling off. [Mem., 7 Aug.]

Specimen 94. The crystallized silver of this beautiful specimen is nearly all of it mixed up with rhombohedral forms of calcite attached to a larger fragment of calcite and purplish fluor, showing specks of copper pyrites and erubescite. The silver-crystals are, for the most part, cubes, more or less perfect, some of which are *particularly* interesting. [Mem., 7 July.]

No further change to this date, except a kind of foliation on the surface of one portion of silver. [Mem., 7 Aug.]

Specimen 123 exhibits perfectly bright white native silver-growths springing from crystallized white calcite, embedded in greenstone (?), which, probably, secretes argentite.

The calcite contains bits of apparently interjected greenstone and a little erubescite. At the base of the specimen, the silver is in a state of semi-crystallization.

In the upper portion are faces of silver-crystals; but towards the extremity, nearly two inches from its base, are two projecting straight, and one curved, silver-growth. [Mem., 7 July.]

No further change perceptible. [Mem., 7 Aug.]

I may mention that the majority of the silver specimens I saw at Kongsberg come fairly under the denomination "growth" and that it is simply impossible to find adequate terms in which to describe the singularity and beauty of some of them.

In one specimen argentite has shot through and through a calcite-crystal, and curled completely round.

Another shows native silver shot through a perfect rhombohedral calcite-crystal; then turned round, crozier-like, and has now a knotty bunch suspended therefrom.

There are many calcite-crystals joined variously together with threads of native silver; and one lovely crystal has silver-growths *inside* of it.

There is one intricately-twisted, and seemingly squeezed silver-growth out of calcite, which is joined to another flat piece of calcite; one portion of this growth is $\frac{3}{4}$ inch thick at its base.

An argentite-crystal has long, thick, curly-growths at one side, with silver in a crystallized state on the other.

A mass of argentite has beautifully twisted silver-growths, and some of them have the appearance of "frosted-silver."

Some of the argentite has a surface look of "landscape-marble."

One curious specimen of argentite is full of *circular* holes, in which calcite is said formerly to have been (?)

Native-silver also occurs here in leaves and flakes upon calcite-surfaces.

One very large recent specimen, composed of mica-schist, "quartz-glimmer," pistacite, purplefluor, &c., shows the usual mode of silver crystallization at these mines.

Another large specimen, composed chiefly of hornblende and mica-schist, with a string of calcite running through it, has silver crystallization like the last.

Mr. Corneliussen, at the mines, obligingly pointed out to me a very large stone which had just come from the workings. This after washing appeared nearly covered with more or less angular silver-spangles. Nothing could exceed the exquisite brightness of that virgin-silver.

I was informed that the silver in the argentite averaged 85 per cent. By analysis, about Ag. Sb S, 70; Ag. S. 30.

It is interesting also to note that, during the metellurgical operations at the reduction works with silver as the primary object, the following elementary substances have been extracted:—Au, Pt, Hg, Bi, Te, Sb, Th, Cu, Pb, Co, Se, and S.

NOTE.—According to *D. Forbes*, the Kongsberg native silver contains 0·40 per cent. Hg.; and Sæmann attributes the fine crystallization to its presence.