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ART. XVI.—*On Tellurbismuth from Dahlonega, Georgia*; by DAVID M. BALCH. (Communicated for this Journal by Dr. C. T. JACKSON.)¹

THE specimen of tellurbismuth submitted to the following examination, was obtained at Field's mine near Dahlonega, Ga., by Dr. C. T. Jackson, who presented it to me with the request that I would carefully ascertain its composition. It appeared to be part of a tabular crystal, and was easily separable into thin folia, very splendid, and quite free from impurities. Before the blowpipe a small portion entirely volatilized, and the peculiar odor of selenium was faintly recognizable. The specific gravity was found to be 7.642 at 18° C. Two portions weighing respectively .827 and .552 grm. were analyzed as follows, the folia being first dissected to ascertain if there was any mechanical admixture of gold in thin layers, which is often the case.

The mineral was digested in hot chlorhydric acid, to which a little nitric acid had been added; it dissolved quickly and left no residue. The solution was now evaporated till all traces of nitrous oxyds were expelled, somewhat diluted, and tested for sulphuric acid by chlorid of barium; the non-formation of a precipitate proved the absence of sulphur in the ore: (any selenium which may have been present would of course not be thrown down, since selenite of baryta is soluble in acids). After the excess of barium had been separated, the solution was evaporated to a small bulk, (a few c. c.) mixed while hot with an excess of bisulphite of ammonia, and set aside for some hours,

¹ *To the Editors of the American Journal of Science*: Gentlemen—An analysis, made by me, some years since, of a tellurbismuth from Field's gold mine in Dahlonega, Georgia, gave results which led me to the belief that it was bornite, and it was published, as such, in your Journal and in the Mining Magazine, of New York.

Dr. F. A. Genth of Philadelphia made a new analysis, which differed from mine essentially, and placed the mineral near tetradymite. Some discussion took place between us, in the Mining Magazine, on the subject, and I thought best,—though I could have easily made a new analysis,—to refer the matter to a chemist, who had not read either of our papers, at that time. I therefore presented to Mr. David M. Balch some carefully selected crystals of the mineral, with the request that he should make an exact analysis of them, and prepare a paper on the subject for publication. * * * I have this day received Mr. Balch's results, which I enclose for publication, and would state that I fully concur with him in the opinion he expresses, namely, that the mineral, being a tellurid of bismuth, is evidently a new species.

In explanation of the error in my original analysis, I would state that the bismuth, having been precipitated before the tellurium, carried down with it a portion of the latter and made the weight of the oxyd of bismuth too high, and that of the tellurium too low. I was not aware that I had made this mistake before I looked back to my laboratory notes of this analysis. I therefore withdraw the name bornite, as not applicable to this species, and adopt the chemical name given it by Mr. Balch.

Respectfully, &c.,
Boston, May 28th, 1862.

CHARLES T. JACKSON.

All the tellurium and selenium present are thus thrown down as a black powder easily washed by decantation. To avoid the precipitation of basic tellurium salts and small quantities of bismuth, it is necessary that the solution should contain much free chlorhydric acid; it should also be concentrated and warm. The precipitate, after the decantation of the supernatant liquid, was washed with dilute sulphurous acid to which some chlorhydric acid had been added, then on a tared filter with water containing a little sulphurous acid, dried at 125° C. and weighed.

The filtrate and washings from the tellurium were evaporated nearly to dryness, the residue dissolved in largely diluted chlorhydric acid, and from this solution the bismuth determined as teroxyd in the usual manner.

Analysis a. .827 grm. gave,

.4256 Bi	=	51.46 pr. ct.
.8990 Te	=	48.26 "
.8246		99.72

Analysis b. .552 grm. gave,

.2847 Bi	=	51.57 pr. ct.
.2690 Te	=	48.73 "
.5537		100.30

To ascertain whether this tellurium contained selenium in appreciable quantity, a portion (.186 grm.) was fused at a dull red heat with six times its weight of a mixture of nitre and carbonate of soda, to convert any selenium present into selenic acid. The fused cake was dissolved in water, and a little nitric acid and nitrate of baryta added; no precipitate formed, even after several days, which proves the absence of selenium, except in minute traces as evinced by the blowpipe test before noticed.

The ore was found to be free from gold, silver and iron.

The specimen that I have analyzed is therefore a pure tellurid of bismuth, Bi Te_3 ; thus—

		Dahlonega.	
		Calculated.	
		a.	b.
Bi	208	51.46	51.57
Te_3	192	48.26	48.73
	400	99.72	100.30
	100.00		

The tellurbismuth from this locality has already been analyzed by Dr. Genth, with nearly the same results as above; he also finds the same formula for the Fluvanna county, Va., mineral.

Allow me to offer a few remarks on the compounds of bismuth and tellurium, suggested by an examination of the many published analyses of this ore from both American and foreign localities. It appears that selenium is present only in traces, and sulphur (where it exists at all) in quantities not exceeding 5 per

cent. The mineral called tetradymite, taking Berzelius's analyses of that from Schoubkau as an example, has the following formula, $(\text{Bi Te}_3)_2 + \text{Bi S}_3$, and other analyses agree closely with this. Examples of a compound or complex mineral formed by the union of two simple ones are common; for instance, bromyrite (Ag Br) and kerargyrite (Ag Cl) unite to form embolite ($\text{Ag Cl} + \text{Ag Br}$); and others might be cited. It seems therefore probable that when sulphur is present in a tellurbismuth, it is due to an admixture of bismuth glance (Bi S_3), and that tetradymite, like embolite, is formed by the union of two simple minerals; in the case of tetradymite these minerals are tertellurid of bismuth, Bi Te_3 , and tersulphid of bismuth, Bi S_3 , (bismuth glance, a mineral much resembling the other in its physical properties).

The native tertellurid of bismuth in a pure state, has been observed only at Dahlonega, Ga., and the "Tellurium Mine," Fluvanna Co., Va., and is up to this time at least, a mineral peculiar to the United States.

Taking this view of the subject, the American tertellurid of bismuth should be considered a new species, to which the term tetradymite is hardly applicable.

In conclusion I would call attention to the fact, that, although by artificial means bismuth and tellurium can be fused together in all proportions, in their native combinations one equivalent of the former appears to be always united to three equivalents of the latter metal; the bornite of Brazil offers the only exception to this rule and according to Damour's analysis differs entirely from the other tellurbismuths.

Salem, Mass., May 20, 1862.

ART. XVII.—*Recent Researches relating to Nebulæ*; by Prof. A. GAUTIER. (Translated for this Journal from the *Bibliothèque Universelle*, for Sept., 1862.)

[We have translated Prof. Gautier's article, both because it furnishes a compact and clear account of the recent researches relating to nebulæ, and for the sake of showing our readers the esteem in which the labors of distinguished American astronomers are held abroad. We have taken the liberty to add foot notes on one or two points where some change seemed desirable.—Eds.]

THERE is no part of the vast field of practical astronomy which does not require laborious investigation. I propose to give a general idea of those researches which relate to a very large and curious class of celestial objects first specially studied by the two illustrious astronomers Herschel and Messier, and more recently by Lord Rosse, by Fathers di Vico and Secchi,