THE

AMERICAN

JOURNAL OF SCIENCE.

Established by BENJAMIN SILLIMAN in 1818.

EDITORS

JAMES D. AND EDWARD S. DANA.

ASSOCIATE EDITORS

PROFESSORS JOSIAH P. COOKE, GEORGE L. GOODALE AND JOHN TROWBRIDGE, OF CAMBRIDGE.

PROFESSORS H. A. NEWTON AND A. E. VERRILL, OF NEW HAVEN,

PROFESSOR GEORGE F. BARKER, OF PHILADELPHIA.

THIRD SERIES.

VOL. XLI.—[WHOLE NUMBER, CXLI.]

Nos. 241—246.

JANUARY TO JUNE, 1891.

WITH XVIII PLATES.

NEW HAVEN, CONN.: J. D. & E. S. DANA.
1891.

Art. L.—*A new Phosphate from the Black Hills of South Dakota;* by W. P. Headden.

The mineral described in this note was found in the Nimrod, now called the Riverton, lode, near Harney City, Pennington Co., South Dakota. It occurs in the granite common to the district, in kidney-shaped masses, some of them weighing upwards of fifty pounds, but they are not numerous. Externally they are dark brown, due to oxidation which has taken place, in some cases, to the depth of a quarter of an inch, in others only on the surface. These masses enclose a few crystals of white mica, but are not penetrated by crystals of this mineral which often adhere to the surface. Some of them show small seams of an almost white mineral with two cleavages nearly at right angles to one another; its composition has not been determined. It is easily recognized under the microscope, especially in polarized light upon which it acts strongly, while the inclosing mineral has no effect upon it. In places there are dark patches visible only in pieces thin enough to transmit light. The mineral is amorphous and by reflected light has a dark brown color; by transmitted light in very thin pieces it is a yellowish brown, in thicker ones a brown color. It has a resinous-vitreous lustre, an uneven to conchoidal fracture and no cleavage. In thin flakes it is translucent to transparent. Specific gravity, 3·401; hardness, 5·5 and is brittle. It is readily soluble in acids, fuses easily in the flame of a candle and reacts for manganese, iron and soda, before the blowpipe.

The material for analysis was carefully selected, only such pieces being taken as were thin enough to show by transmitted light that they were free from the dark patches and macroscopic seams. The results were as follows:

	I.	II.	III.	IV.	V.	Mean.	Oxygen.		
P_2O_5	38·61	38·22	38·45	38·49	38·86	38·52	·217	2·17—	1
MnO	29·74	29·74	28·97	30·08	....	29·64	·0668		
CaO	7·70	7·66	7·66	7·08	7·28	7·47	·0213		
Al_2O_3	9·94	10·34	10·09	....	10·14	10·13	·0472		
FeO	3·83	4·14	4·01	4·00	....	4·00	·0089		
MgO	0·14	....	0·16	....	...	0·15	·0006	1·977	0·91
Na_2O	5·52	....	5·70	5·68	....	5·52	·0142		
K_2O	0·30	....			....	0·30	·0005		
Li_2O	trace	....	trace	....	....	trace			
H_2O	4·15	....	4·43	....	....	4·29	·0382		
Cl	0·11	...	not det.	....	....	0·11			
F	trace	....	...	....	....	trace			
Insol.	0·14	....	0·18	....	....	0·16			
	100·18		99·65			100·29			

This ratio approaches 1 : 1 and includes the water as basic and the whole of the iron as FeO. If the water be considered as water of hydration, the oxygen-relations cannot be expressed by any simple ratio. If instead of computing the oxygen alone we reckon the atomic equivalents we obtain as favorable a ratio; for, substituting an equivalent number of bivalent atoms for Al_2^{vi} we obtain for the ratio of $P : \ddot{R} : O = 1 : 2{\cdot}49 : 5{\cdot}18$ instead of $1 : 2{\cdot}5 : 5$ or $2 : 5 : 10$ corresponding to the formula $P_2\dot{R}_6O_{10}$ which is a salt corresponding to the normal phosphoric acid H_6PO_4 and in which $R = (MnCaFeH_2Na_2)\frac{2}{4} + Al\frac{1}{4}$. Other complete analyses, than those given were made of less care fully selected material with closely agreeing results.

I would propose to call this new phosphate Griphite, from γριφος *puzzle*, in allusion to its unusual and somewhat enigmatical composition.

A Phosphate near Triphylite from the Black Hills.

A mineral, associated with beryl and spodumene, occurs in nodules in the granite of the Nickel Plate tin claim, Pennington Co., South Dakota. The inner portions of these nodules are nearly free from other minerals while the outer portions contain some small bunches of mica, a few isolated, black, prismatic crystals, which are brown by transmitted light, and here and there small patches of a light brown mineral with resinous luster, conchoidal fracture and one distinct cleavage. Neither the black crystal nor the light brown masses seem to be derived by decomposition, from the surrounding mass as it is wholly unaltered.*

The mineral forming these nodules, is, in the mass, dark green, in thin splinters, it is translucent to transparent and is a light yellowish green; it fuses easily on the edges of thin pieces in the flame of a candle, to a dark brown, magnetic globule and colors the blowpipe flame a faint yellow. It has a hardness of about 5, a specific gravity of 3·612; cleavage in two directions, in one it is perfect in the other it is quite imperfect and the directions are not at right angles to each other. The lustre is vitreous and the fracture uneven to small conchoidal; streak and powder very light green, almost white. When exposed to the atmosphere for a short time it darkens externally due to oxidation. The freshest material was taken for analysis which gave the following results:

* Subsequent examination showed the black prismatic crystals to be crystals of cassiterite with the usual combination of the pyramid and prism, the prism being very strongly developed. Many of these crystals are fretted to such an extent that they form almost skeleton crystals.

	I.	II.	Mean.		At. Eq.		
P_2O_5	38·52	38·76	38·64		54·16	54·66	1
FeO	25·29	24·82	25·05		34·78		
MnO	15·45	15·64	15·54		17·40		
CaO	5·42	5·64	5·53		9·87		
MgO	1·56	1·44	1·50		4·00	81·20	1·5
Na_2O	7·46	(7·46)	7·46	(R_2)	12·02		
K_2O	2·00	(2·00)	2·00	"	2·12		
Li_2O	(·28)	·28	·28	"	1·00		
F	·69	(0 69)	·69	oxygen			
Ignition	·73	(0·73)	·73		223·	223·00	4·09
Gangue	2·49	2 44	2·47				
	99·89	99·88	99·89				

This ratio 1 : 1·5 : 4·09 or 2 : 3 : 8 indicates $\overset{II}{R_3}P_2O_8$ as the formula for the mineral in which the ratio of $\overset{I}{R_2} : \overset{II}{R}$ is 1 : 4·4 or 2 : 9 giving as molecular formula $2(\overset{I}{R_2})_3P_2O_8 + 9\overset{II}{R_3}P_2O_8$ or better $4\overset{I}{R_3}PO_4 + 9\overset{II}{R_3}P_2O_8$. The ratio of $\overset{I}{R_3}PO_4$ to $\overset{II}{R_3}P_2O_8$ in triphylite is 1 : 1 but here it is 1 : 2¼, too wide a deviation to admit of their being regarded as identical.

ART. LI.—*Note on Certain Peculiarities in the Behavior of a Galvanometer when used with the Thermopile;* by ERNEST MERRITT, M.E.

(Contributions from the Physical Laboratory of Cornell University, No. 8.)

WHEN a galvanometer, whose needle is not too thoroughly damped, is used in connection with a thermopile, a curious phenomenon is observed. On suddenly exposing one face of the pile to some source of radiant heat, the needle of the galvanometer moves quickly to one side. In a short time, however, the motion becomes less rapid, and in the course of a few seconds the needle comes to rest, and in many cases moves backward for a short distance. This behavior is then repeated, and it is only after a long series of such throws, which gradually become less and less marked, that the final steady deflection is reached. The curve OAB in fig. 1 represents graphically this peculiar motion as observed in the case of a Thomson tripod galvanometer, the abscissa of any point on the curve showing the time that has elapsed since the beginning of the motion, and the corresponding ordinate being proportional to the deflection of the needle from its position of rest. With a galvanometer whose needle is more nearly "dead beat" the maxima and minima which are so clearly shown in the figure, may not be present; but the general form of the curve will still be the same.