PHYSICAL PROPERTIES: Color olive green to grayish green; in aggregates of small crystals with curved, rough faces. Sp. gr. = 6.19; H = 3.

CHEMICAL PROPERTIES: Before the blowpipe decrepitates and gives tests for As and Pb. Readily soluble in acids. Analysis gave: PbO 50.10, CuO 19.32, ZnO 0.46, CaO 0.75, As_2O_5 26.01, H_2O − 0.08, H_2O + 2.65, SiO_2 0.44, sum 99.81 per cent. This is thought to correspond to $2Pb_3(AsO_4)_2 : Cu_3(AsO_4)_2 : 4Cu(OH)_2$.

OCCURRENCE. Occurs associated with azurite crystals and coated with bauxite-like material, on a specimen brought back from the Tsumeb region in 1911 by the late mining engineer Zeleny.

DISCUSSION: [This may be a member of the olivenite group, but until better data are obtained, it is to be retained in the doubtful class. At any rate the formula corresponding to the analysis is evidently simply $PbCu(OH)(AsO_4)$.] W. F. F.

ABSTRACTS—CRYSTALLOGRAPHY

THREE MINERALOGICAL NOTES—(CALCITE, QUARTZ, SPHALERITE). G. AMINOFF. *Geol. Fören. Förh.*, **38**, 201–211, 1916.

Comprises crystallographic descriptions of a parallel-growth of calcite from Garta, Arendal, with one new form $(19.1.\bar{2}0.0)$; a quartz hetero-twin after the Zinnwald law from Offerdalen, Jämtland; and colorless tetrahedrons of sphalerite from Slättberg, Dalarne, Sweden. E. T. W.

CALCITE TWINS FROM FÄRÖARNA. G. AMINOFF. *Geol. Fören. Förh.*, **38**, 339–348, 1916.

A detailed crystallographic description. Deviations from the theoretical twinning position are considered, and found to amount to up to 15′, there being proportionality between amount of deviation and number of observations. E. T. W.

TWO NEW OCCURRENCES OF WELL CRYSTALLIZED SWEDISH MINERALS. GUST. FLINK. *Geol. Fören. Förh.*, **38**, 463–472, 1916.

Inesite is described from Långban in tabular crystals with *a*, *b*, and *f* the dominant forms. Apophyllite from the Dannemora mines is in tabular crystals with a number of modifying forms. E. T. W.

CRYSTALLOGRAPHIC STUDIES OF PHENYL BENZOATE. MARIA STURA. *Riv. min. crist. Ital.*, **48**, 86–90, 1917.

The system is monoclinic; crystallographic data are given. E. T. W.

THE CRYSTAL STRUCTURE OF THE ALUMS AND THE RÔLE OF WATER OF CRYSTALLIZATION. C. SCHAEFER AND M. SCHUBERT. *Ann. Physik*, **55**, 397–400, 1918; **59**, 583–588, 1919; L. VEGARD, **58**, 291–296, 1919.

Continuation of discussion; compare *Am. Min.*, **4** (8), 103, and **5** (7), 139. E. T. W.

THE LAWS OF CURIE AND HAÜY. C. VIOLA. *Bull. soc. franc. min.*, **41**, 108–116, 1918; G. FRIEDEL, **41**, 196–198, 1918.

A mathematical discussion, in which the so-called law of Curie is questioned. E. T. W.

ABSTRACTS—MINERALOGY

INVESTIGATIONS ON SWEDISH APATITES. KARL A. GRÖNWALL. *Geol. Fören. Förh.*, **38**, 411–434, 1916.

Apatite from Nordmarken is described in detail. Analysis shows it to be a nearly pure fluorapatite (Cl only 0.05%); its sp. gr. = 3.194. The crystals are tabular to prismatic with a number of pyramids, and the best value for c is 0.7326. Optical measurement gave (for D): $\omega = 1.638$, $\epsilon = 1.635$. Comparisons are made with many other occurrences. A crystal of the same from Bolandsgrufvan is nearly bipyramidal, with numerous modifying faces; it gave $c = 0.7333$. E. T. W.

NEW MINERAL ANALYSES. HERMAN HEDSTRÖM. *Geol. Fören. Förh.*, **38**, 435–440, 1916.

Comprises apophyllite from the Harstig mine, melanotekite from Harstig and from Jakobsberg, and manganophyllite from Alnön, Sweden. E. T. W.

OLIVINE FROM ETNA. F. STELLA STARRABA. *Rend. mem. accad. sci. Acireale*, [3], **9**, 41–65, 1917; thru *J. Chem. Soc.* and *Chem. Abstr.*, **15** (9), 1270–1271, 1921.

Analyses are given of two types of olivine, both rather high in FeO and in Fe_2O_3. Increase in Fe content deepens the color and raises the sp. gr. and refractive indices. E. T. W.

MINERALOGICAL NOTES, II and III. NILS ZENZÉN. *Geol. Fören. Förh.*, **38**, 477–480, 1916.

A specimen of ganomalite analyzed by Lindström has been relocated. It proves to have double refraction 0.050, and to have distinct hexagonal cleavage. The indices of microcline from Tunaberg have been measured, giving: α 1.5182, β 1.5223, γ 1.5253. E. T. W.

THE HARDNESS SCALE FROM 4 TO 5. P. J. HOLMQUIST. *Geol. Fören. Förh.*, **38**, 501–520, 1916.

There is considerable discrepancy in the recorded data as to the relative hardness of apatite and fluorite, which are respectively 5 and 4 in the usual hardness scale, some measurements making fluorite the harder. It is interesting to note that while minerals with H 2–3 and 5–6 are abundant (nearly 25 per cent. of each), there are only 16 per cent. with H 3–4 and less than 15 per cent. with H 4–5. Extensive grinding experiments were made, and it was found that apatite on face $(10\bar{1}0)$ is 1½ times as hard as fluorite on (111) if steel powder is used as the abrasive. The harder the abrasive used, however, the relatively harder fluorite seems. It is probable that fluorite may in fact be the harder mineral. These peculiarities are no doubt connected with the greater perfection of the cleavage in fluorite. Evidently the usually accepted hardness scale needs improvement. E. T. W.

THE GRINDING HARDNESS OF MINERALS. L. H. BORGSTRÖM. *Geol. Fören. Förh.*, **41**, 448–453, 1919.

The results described in preceding abstract are confirmed and extended, and it is found also that time of grinding is an important factor, the longer the time the greater the contrast in hardness of minerals adjoining one another in the scale. E. T. W.