

tween 300°C. and 500°C., H. F. Carl obtained a powder-diffraction pattern (C) with an automatic recording Philips  $x$ -ray spectrometer which compares favorably with that obtained by McConnell (M) with unfiltered iron radiation. The crystallinity of the Australian material may be similar to that of certain tantalum-columbium minerals. Fergusonite, for example, is normally amorphous in the natural state but becomes crystalline after being heated to 400°C. (4).

#### ACKNOWLEDGMENT

The work reported in this paper was done under the general direction of J. B. Zadra, Chief, College Park Division, Metallurgical Branch, and under the immediate supervision of Alton Gabriel. The chemical analyses were made by R. D. Dwiggins and A. E. Yelmgren, the  $x$ -ray data were furnished by H. F. Carl and the spectrographic data by M. J. Peterson, all of the College Park Division, Metallurgical Branch staff. Their contributions are gratefully acknowledged.

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#### LOELLINGITE FROM ARIZONA

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Loellingite ( $\text{FeAs}_2$ ), a comparatively rare arsenic mineral, has been identified as a minor constituent of a zinc-copper ore mined from the Copper World Mine near Yucca, Arizona. It is an uncommon mineral and believed not previously described from Arizona. A description of its occurrence, mineralogical associations and chemical analysis is of interest at this time.

The Copper World Mine was rehabilitated with a preliminary development loan from the Government to mine high grade zinc sulfide as an aid to the war effort. During the development program, the mine was visited periodically to check on the progress and to note any changes. In December, 1945, during a routine examination of the underground workings, a few small specimens of a heavy, bright-silvery looking mineral were pointed out as being new in the ore. Some of the miners had uncovered a boulder of this material about the size of a man's head on the fifty-foot level, and at that time they were much excited for they believed it to be a mass of solid silver. During this excitement much of the original boulder

had disappeared into the hands of inquisitive visitors and miners, but a sufficient amount was left and subsequently submitted for further study.

Part of the material was taken to the mineralogical laboratory at the University of Arizona, where through the courtesy of Dr. M. N. Short, some polished sections were made and examined under the reflecting microscope. Such an examination showed the loellingite essentially free of extraneous minerals. Only a few scattered blebs of sphalerite and chalcopyrite were observed.

Some fourteen analyses of loellingite<sup>1</sup> recently have been brought together and in order to compare the Arizona loellingite with them, a carefully selected sample of about 20 grams was submitted to the Arizona Testing Laboratory, Phoenix, Arizona, for a complete chemical analysis. Mr. Claude E. McLean, chemist, lists the following elements present:

Fe.....	25.76%
Co.....	0.10
Ni.....	1.55
As.....	65.57
S.....	2.73
Cu.....	0.40
Zn.....	0.15
Pb.....	0.05
Al <sub>2</sub> O <sub>3</sub> .....	2.02
SiO <sub>2</sub> .....	1.30
MgO.....	0.14
CaO.....	0.11
	<hr/>
	99.88%
Mn*.....	0.01
Sb*.....	0.001-0.01
Ag*.....	0.001-0.01
Au*.....	0.001
Ga*.....	0.001

\* These elements were determined with the spectrograph.

An interesting features of the analysis is the presence of sulfur and nickel, but neither one in sufficient amount to make the mineral a variety of loellingite. The presence of alumina, silica, magnesia and lime is accounted for by contamination of the sample from wallrock schist or tremolite gangue. The small amount of copper, lead and zinc comes from the presence of small blebs of sphalerite and chalcopyrite. Removal of the gangue and blebs of sulfides from the analysis will give the Arizona loellingite a close approximation to the ideal composition.

<sup>1</sup> *Dana's System of Mineralogy*, Seventh Edition, Charles Palache, Harry Berman and Clifford Frondel, Vol. 1, p. 305 (1944).

At the Copper World Mine, loellingite is a very minor mineral in a deposit consisting of a few simple sulfides. These minerals are sphalerite, most abundant; chalcopyrite, next; and pyrrhotite, minor; but more abundant than loellingite. Pyrite and galena have not been observed. The gangue mineral is tremolite, but some biotite-like micas were observed along the walls of the ore. The ore deposit is lenticular and parallels the foliation of the granitic schist. In less than eighteen months of operation this small deposit has produced over 1.5 million pounds of zinc, and may continue on as a small producer for many years. Thus with the reopening of a small mine rich in zinc sulfide ore, a mineral new to Arizona has been found.

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## PROCEEDINGS OF SOCIETIES

### PHILADELPHIA MINERALOGICAL SOCIETY

*The Academy of Natural Sciences of Philadelphia, January 3, 1946*

Dr. W. Hersey Thomas presided, with 55 persons present. Dr. J. D. H. Donnay spoke on "DIFFRACTION OF X-RAYS IN CRYSTALS." He stated that  $d/n$  values had been tabulated for approximately 2500 substances. Mr. Birchall exhibited a small collection of minerals obtained by his son who was with the U. S. Army in Belgium.

*February 7, 1946*

Dr. Thomas presided; 54 persons were present. Mr. John Cochrane reviewed "THE INDUSTRIAL APPLICATIONS OF THE SULFUR GROUP ELEMENTS—SULFUR, SELENIUM, AND TELLURIUM." Mr. Kissileff described a trip to New Hampshire and Vermont with Mr. Gordon, exhibiting specimens from pegmatites.

*March 7, 1946*

Dr. Thomas was in the chair, with 72 persons present. Dr. Richard M. Foose spoke on "THE BROWN IRON ORES OF PENNSYLVANIA." By means of stratigraphic, structural and physiographic control, a large ore body was found at White Rocks in Cumberland County. Isopach maps of the overburden and ore body, and logs of drilling were shown. The paragenesis of the iron and manganese oxides was probable as follows: (1) replacement of clay by limonite of rust-brown color, (2) replacement by dark brown or black limonite, (3) replacement by manganese oxides, and (4) replacement by goethite. Associated minerals are: barite, sphalerite, pyrite, jasper, quartz, wavellite, collophane. Impurities in the oxides include Co, Ni, Ti, V, etc. The concentration was probably affected by descending solutions from overlying, impure limestones.