be done with ordinary thin sections. Furthermore, inasmuch as little cost is involved in cutting and staining the slabs, many analyses could be made to reduce errors of sampling and of imperfect mixing in a rock mass. Grain boundary estimation is generally made on a planar opaque surface; therefore, there is no accumulative error, as in thin section analysis, owing to the presence of colorless minerals over opaque or strongly colored grains. Binocular vision in making the counts markedly decreases eye strain and the possibility of errors due to operator fatigue. The entire operation of cutting slabs, staining, and counting, can be readily and economically performed by unskilled personnel.

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YTTRIA IN ZIRCON

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The isostructural relationship of xenotime (YPO_4) and zircon ($ZrSiO_4$) is well known (Vegard, (1)), and isomorphous replacement of zircon by xenotime is assumed to be a common phenomenon; however, little published information is available as to the amount of such substitution that occurs.

The present investigation is a reconnaissance of the yttria content of natural zircons. Fifteen specimens from various localities and environments have been analyzed in order to gain some insight into the distribution of xenotime in zircons.

Analyses were made using a semi-quantitative spectrographic technique in which the yttria content of one zircon, concentrated from North Carolina beach sand, was determined using the addition method outlined by Ahrens (2). Two determinations using Specpure Y_2O_3 and xenotime gave 2.4 and 2.3% Y_2O_3, respectively, for this standard. The yttria content of other samples was then found by comparison with the standard. All samples were ground to −400 mesh, tamped into carbon

TABLE 1

Specimen	Locality	$\%Y_2O_3$
Twinned zircon	Renfrew, Ontario	2.5±0.2
Zircon	Fredericksvarn, Norway	3.0±0.5
Zircon	Warwick, N. Y.	2.8±0.2
Zircon in nepheline	Norway	2.9±0.1
Zircon in syenite	Fredericksvarn, Norway	2.4±0.2
Zircon, concentrated from beach sand	North Carolina	2.4±0.2
Zircon, malacon	Hitteroen, Norway	4.3±0.7
Zircon	Essex Co, N. Y.	2.5±0.3
Zircon	No. Burgess Twp., Lanark Co., Ontario	2.4±0.1
Zircon	St. Peters Dome, Pikes Peak, Colo.	2.2±0.2
Zircon	Buncombe, N. C.	1.9±0.1
Zircon, cyrtolite	New Ross, Nova Scotia	3.9±0.2
Zircon	Madagascar	1.6±0.1
Zircon	Grattan, Ontario	>1.5
Zircon	—unknown—	2.1±0.5

electrodes, and excited as the anode in a 3 ampere d.c. arc. Each sample was run three or more times. The spectral line Y3216 Å was used for all microphotometric work.

The analytical results are given in Table 1. The yttria content ranges from a minimum of 1.6% to a maximum in a malacon of 4.3%. The yttria content is lognormally distributed with the mode at about 2.5% Y_2O_3.

The value of 2.5% Y_2O_3 corresponds to the presence of about 4% of txenotime by weight, which may be taken as he expectable amount of replacement by xenotime that the average zircon experiences.

An attempt to beneficiate the xenotime by magnetic separation was

TABLE 2

Sample		$\% Y_2O_3$
Zircon from pegmatite, Rockingham Lake, Renfrew Co., Ont.	mag.	4.7±0.8
	non mag.	2.5±0.4
Zircon from pegmatite, Troopers Lake, Glamorgan Twp., Ont.	mag.	3.1±0.7
	non mag.	2.3±0.4
Zircon from syenite, on Rte. 54 near Chicotimi, P.Q.	mag. at 4°	2.5±0.3
	mag. at 3°	3.0±0.3
	mag. at 2°	2.3±0.4

unsuccessful. Three samples of zircon separated from granite were run through a Franz Isodamic Separator and the fractions analyzed. The results are tabulated in Table 2.

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HYPOGENE GOETHITE AT PEKO MINE, N.T., AUSTRALIA*

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The primary copper ore at the Peko mine, Tennant Creek, Northern Territory, Australia, contains about 9 per cent copper and 4.5 dwt. gold per ton. It is associated with a lens of magnetite rock, and consists of remnants of the magnetite rock in varying stages of replacement by pyrite, chalcopyrite, pyrrhotite, marcasite and minor amounts of wolframite, cobaltite, (?)safflorite, sphalerite, galena, bismuthinite, native bismuth, matildite, tetrahedrite, native gold, hematite and goethite (Edwards, 1955). The gangue minerals include quartz, siderite and chlorite.

Three ore zones have been exposed in development. From 200 ft. to 270 ft. (vertical depth) the ore is intensely oxidized and consists essentially of cuprite and native copper with some residual chalcocite, pyrite and native bismuth. From 270 ft. to 315 ft. it consists largely of chalcocite and covellite with variable amounts of residual chalcopyrite, pyrite and other primary minerals. Below 315 ft. depth the ore consists of primary sulfides.

On the 400-ft. level, in a zone of high grade ore, there occur a number of ovoids, or near spherical, bodies of relatively coarse-grained, massive pyrite from 2 cm. to 15 cm. diameter, which interrupt the weak banding in the ore. The banding is marked by thin strings of residual magnetite crystals running through massive chalcopyrite, parallel to the bedding of the wall rocks. It continues undisturbed above and below, and on either side of each individual ovoid of pyrite.

The contacts of these pyritic ovoids with the chalcopyrite ore are marked by dark brownish-black rims. These dark rims are somewhat irregular in thickness and shape. They look like reaction rims, in that their width corresponds to the size of the particular pyritic ovoid, rang-

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