that the siliceous skeletal residue is also extraneous matter and the mineral is a hydrous vanadate rather than a silico-vanadate.

It seems probable that the mineral we have examined in two specimens from the type locality is the vanadate originally described and named kolovratite by Vernadsky (1922). Our evidence suggests, however, that kolovratite is a hydrous zinc-nickel vanadate, or possibly a silico-vanadate, rather than a nickel vanadate as inferred in the original description.

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SOME MINERAL OCCURRENCES NEAR EAU CLAIRE, ONTARIO*

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Pyrochlore Pegmatites

Pyrochlore-bearing pegmatites were found in 1956 in Calvin Township in the Nipissing district, several miles south of Eau Claire, just east of

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the Amable du Fond River, Ontario. The main group of dikes extends along a northeasterly line from lot 17, through lot 16 and into lot 15, all in concession II.

The exposures here appear as elongated, glacially rounded ridges, chiefly of the pegmatites; the wall rocks are very poorly exposed. At least three dikes are present. The southwestern end of the cluster was prospected in 1956 and 1957 by means of two shallow pits and several diamond drill holes. Two small cuts were made in pegmatite at the northeast end of the group many years ago in search of feldspar. Here also two diamond drill holes were completed in 1957.

The dikes strike about N. 15–20° E. and either dip very steeply southeast or northwest or are vertical. They range in thickness from 4 to 18 feet, and the longest has been traced for about 1200 feet.

The main wall rock is a gray quartz-feldspar gneiss, containing about 10% biotite in minute flakes in thin, parallel, closely spaced, discontinuous bands. The trend of the foliation is variable, but the pegmatite contacts are transgressive at angles from a few to nearly 90°. Along the pegmatite contacts the gneiss contains narrow selvages of fine-grained muscovite. About 300 feet southwest of the southwesternmost pegmatite exposures are float blocks of coarse amphibole schist, which consists chiefly of glistening dark green actinolite blades as much as ½ inch long, with lesser amounts of plagioclase, quartz, and chlorite.

Zoning in the dikes is well developed:

1. Border zones as much as several inches thick, consisting almost entirely of peristeritic oligoclase (Ab_{79-80}) in grains as much as an inch across. Many of the larger grains have their long axes normal to the contact. A few minute muscovite flakes are also present.
2. Wall zones, generally occupying the largest part of the dikes, consisting primarily of oligoclase (Ab_{84-85}), quartz, microcline, and muscovite. Accessory minerals are magnetite, pyrochlore, euxenite, and allanite.
3. Discontinuous and locally developed intermediate zones of blocky microcline crystals, 6–8 inches across.
4. Core pods of milky quartz, some 6–8 feet thick and as long as 30 feet.

Both microcline and oligoclase are grayish white except at the northeastern end of the main dike, where the feldspars are mottled pink-white.

The only post-consolidation mineralization in the dikes is represented by coatings of green sericite along small fractures in the wall and intermediate zones. Subsequent movements have slickensided these mica coatings.

Pyrochlore occurs only in wall-zone rock as rounded anhedra as large as an inch across, which are the foci of the usual radial fracture system. A thin halo of reddish-brown alteration also surrounds them in feldspar. The grains are widely disseminated; no concentrations or "shoots" have

been found. Analyses of pyrochlore-bearing parts of the diamond drill cores showed Nb = .005–.079% and Ta = nil; thick sections were Nb-free. The pyrochlore is a deep clove brown in colour, metamict, with $n = 1.967$, $D = 5.20$.

Associated with the pyrochlore are lesser amounts of euxenite in thin lustrous black blades as much as $\frac{1}{2}$ inch long and a very few rusty needles of allanite an inch or less long. The identity of the euxenite, which also is metamict, also was confirmed by means of powder x-ray diffraction data.

These pegmatites are very similar to one described by Ellsworth (1932, pp. 189–191), which crops out on lot 29, concession III, Mattawan Township, about 5 miles west of Mattawan. The zoning in this dike is similar to that of the Eau Claire dikes, with plagioclase-rich wall zones, an intermediate zone of microcline or microcline-quartz and a quartz core. This dike contained euxenite, apparently chiefly in wall zone rock, in masses as much as 4–5 inches in diameter. This euxenite was analysed by Ellsworth (1932, pp. 262–263, Analysis XXI).

The presence of pyrochlore as a primary constituent of zoned granitic pegmatites has been noted before, but it is very uncommon in such a paragenesis. It is, however, a widespread accessory in alkalic and alkalic-subsilicic rocks and their pegmatites and especially in carbonatites. Normally, if a member of the pyrochlore-microlite series occurs in granitic pegmatites it is microlite, which is younger than any associated columbite or tantalite and occurs as a constituent of albitized (and usually Li-rich) pegmatite, in some instances even replacing columbite or tantalite. Doubtless one of the factors contributing to the crystallization of pyrochlore in these dikes instead of the more usual columbite has been the scarcity of Fe (or Fe + Mn) in these pegmatites and the strong concentration of Ca in the oligoclase-rich wall zones.

Eulysite

Iron formation crops out on lot 24, concession V, Calvin Township, west of the Amable du Fond River and southwest of Smith Lake. The outcrops form an arcuate band trending generally northeast, extending from the upper part of the western side of a conspicuous ridge to near its top, over a distance of several hundred feet. Float boulders are conspicuous, and near the northeast end of the area a shallow prospect pit has been dug. The thickness of the metamorphic layer appears to be from about 4 to more than 10 feet. Wall rocks are not exposed.

The rock is reddish black, strongly magnetic and has a high specific gravity. Megascopically conspicuous on freshly broken surfaces are large euhedral porphyroblasts of plagioclase, some as much as 1.3 × 3.8 cm

in section, showing very coarse albite twin lamellae. Microscopic study shows that the rock is a eulysite, containing chiefly fayalite, hedenbergite, garnet, magnetite and apatite, in addition to the labradorite (An_{68}) porphyroblasts. Accessory amounts of iron-rich hornblende also are present (Table 1).

TABLE 1. MODE OF EULYSITE, EAU CLAIRE, ONTARIO

Hedenbergite	34.4%
Fayalite and its alteration	18.3
Magnetite	17.5
Hornblende	8.5
Apatite	6.2
Labradorite	5.5
Vermicular intergrowth of hedenbergite-garnet	9.6
Biotite	tr.
	100.0

The texture is xenoblastic, coarsely gneissic, with only some of the hedenbergite approaching a subhedral form. Next to the plagioclase prophyroblasts, the coarsest grains are of hedenbergite and fayalite. Magnetite forms network aggregates that are generally interstitial to the olivine-pyroxene grains. Most of the apatite is included in or closely associated with the magnetite as subhedral to euhedral crystals. Hornblende, pleochroic in dark brown and olive brown, replaces hedenbergite marginally, as irregular rims of small grains, especially along magnetite-pyroxene grain boundaries. A few flakes of biotite also occur in these hornblendic rims. Olivine grains are wholly or in part altered to flaky aggregates of a brown, strongly birefringent ferriferous chlorite.

The most conspicuous element of the foliation is formed by small lenses of an extremely fine-grained, uniformly vermicular to dactylic intergrowth. Under highest magnification this is resolvable into "fingers" and blebs of skeletal hedenbergite that extinguish as units, set in subhedral to euhedral garnet crystals. Small grains of plagioclase are scattered through parts of the intergrowth. The percentages of the three constituents in the intergrowth are estimated to be:

garnet	55%
hedenbergite	35
plagioclase	10

The optical properties of the pyroxene are: light green, essentially non-pleochroic; contains two types of exsolution products, (*a*) very thin plates of another (ortho- ?) pyroxene parallel with (100); (*b*) magnetite (?) rods and platelets in two sets—parallel with *c* and with (001); generally a

thin outer zone is free of these inclusions; $\gamma = 1.733$, $2V = (ca.)\ 60°$, $(+)$, $r > v$, strong, $\gamma \wedge c = 44°$. It is estimated to contain 56% hedenbergite molecule. Before exsolution the Mg/Fe and Ca/Mg + Fe ratios were both lower.

The optical properties of the olivine are: very pale pink; $\alpha = 1.785$, $2V = 65°$, $(-)$ $r > v$, very strong. It is estimated to contain 78% of the fayalite molecule.

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HEAVY MINERALS IN SANDS FROM THE OLD FORT AREA, QUEBEC

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Introduction

Extensive deposits of sand occur along the coastal areas bordering the northeastern arm of the Gulf of St. Lawrence. Sand, similar to that along the coast, is also found inland as far as 75 miles from tidal waters. These buff sands are composed essentially of feldspar and quartz but they also contain distinctive and irregularly distributed "streaks"[1] consisting of dark, heavy minerals.

The general geological features of a larger region which includes the Old Fort Area (Fig. 1) have been described by Hale (1961). Most of this region is underlain by granitic gneisses in which narrow bands of quartzitic, biotitic, amphibolitic, calcareous, and pyroxenitic, gneiss and schist occur. In addition to the gneisses, there are large irregular masses of amphibole- and pyroxene-rich rocks and several discrete masses of gabbro-anorthosite, one of which is exposed about Old Fort Lake.

The consolidated rocks of the region are extensively exposed along the shore of the Gulf and inland from it for an average of five miles. The shoreline exhibits evidence of recent submergence followed by more recent emergence. Beach strands, paralleling the coastline but up to several miles inland from it, are a characteristic feature of this part of the Gulf. The widespread, buff sands now appear to be part of what was

[1]The word, "streak," is used here rather than "horizon" or "layer" both of which suggest greater horizontal continuity than is characteristic of the black portions of the St. Lawrence sands.