GEOLOGICAL SURVEY OF CANADA

DEPARTMENT OF ENERGY, MINES AND RESOURCES

PAPER 68-7

AN ONTARIO KIMBERLITE OCCURRENCE DISCOVERED BY APPLICATION OF THE GLACIOFOCUS METHOD TO A STUDY OF THE MUNRO ESKER

Hulbert A. Lee

Price, 75 cents

1968

GEOLOGICAL SURVEY
OF CANADA

PAPER 68-7

AN ONTARIO KIMBERLITE OCCURRENCE DISCOVERED BY APPLICATION OF THE GLACIOFOCUS METHOD TO A STUDY OF THE MUNRO ESKER

Hulbert A. Lee

DEPARTMENT OF ENERGY, MINES AND RESOURCES

Available by mail from the Queen's Printer, Ottawa,

from Geological Survey of Canada,
601 Booth St., Ottawa,

and at the following Canadian Government bookshops:

HALIFAX
1735 Barrington Street

MONTREAL
Æterna-Vie Building, 1182 St. Catherine St. West

OTTAWA
Daly Building, Corner Mackenzie and Rideau

TORONTO
221 Yonge Street

WINNIPEG
Mall Centre Bldg., 499 Portage Avenue

VANCOUVER
657 Granville Street

or through your bookseller

Price $.75 Catalogue No. M44-68-7

Price subject to change without notice

ROGER DUHAMEL, F.R.S.C.
Queen's Printer and Controller of Stationery
Ottawa, Canada
1968

ABSTRACT

A kimberlite dyke was discovered in northern Ontario by application of the glaciofocus method of tracing mineral and rock fragments in an esker to their bedrock source.

AN ONTARIO KIMBERLITE OCCURRENCE DISCOVERED BY APPLICATION OF THE GLACIOFOCUS METHOD TO A STUDY OF THE MUNRO ESKER

INTRODUCTION

Techniques to trace mineral and rock fragments in eskers to their bedrock source have been developed and tested by the writer for the past four years in a program designed to assist in mineral exploration; one facet is the exploration method termed 'glaciofocus' (Lee, 1964, 1965, 1966). By inference from glaciofocus techniques, the presence of concentration peaks of pyrope garnet in the Munro esker (Lee, 1965) has led to the discovery of a body of kimberlite in the Upper Canada Mine, Gauthier Township, Ontario, 10 miles east of Kirkland Lake. The discovery is of interest because (a) there is a known association of some kimberlite bodies with diamonds; and (b) kimberlite bodies commonly occur in groups.

CLASSIFICATION OF THE ROCK

The rock fits Dawson's definition (1967, pp. 242, 244) of a "massive micaceous kimberlite". It occurs as a vertical dyke in underground workings of the Upper Canada Mine. The full petrological and chemical description of the rock will be presented in a forthcoming paper by Lee and Lawrence (in preparation) and will not be reported here. The age determined for the kimberlite is 151 ± 8 million years (K/Ar on phlogopite; Wanless et al., 1968) indicating that the dyke is Late Jurassic age, much younger than the surrounding rocks of known Precambrian age.

STUDY OF THE MUNRO ESKER

Study of the Munro esker which trends S 12° E and passes close to the Upper Canada Mine revealed concentration peaks of pyrope garnet with some associated kimberlitic rock fragments (Lee, 1965, 1968). This pyrope is the magnesium-rich variety characteristic of kimberlite.

The stratum in the esker which contains the pyrope concentrations has been thoroughly investigated, and the results can be utilized in the glaciofocus method (Lee, 1967, 1968). When applied to an esker, this glaciofocus method uses a displacement measured from the site of a known source in bedrock, along the direction of former glacier transport, to a site of peak concentration in the esker (Fig. 1). The displacement-vector ($\vec{K}$) of Figure 1 has been established for the Munro esker on the basis of a gold particle peak that is displaced from a known source site of the Upper Canada Mine. By plotting the distribution curves of gold particles and pyrope grains on data obtained from a study of the Munro esker (Lee, 1965, pp. 14, 15) it can be shown that they have a common peak distribution, as shown on Figure 1). As both were subjected to the same displacement-vector, then both must have the same general source area.

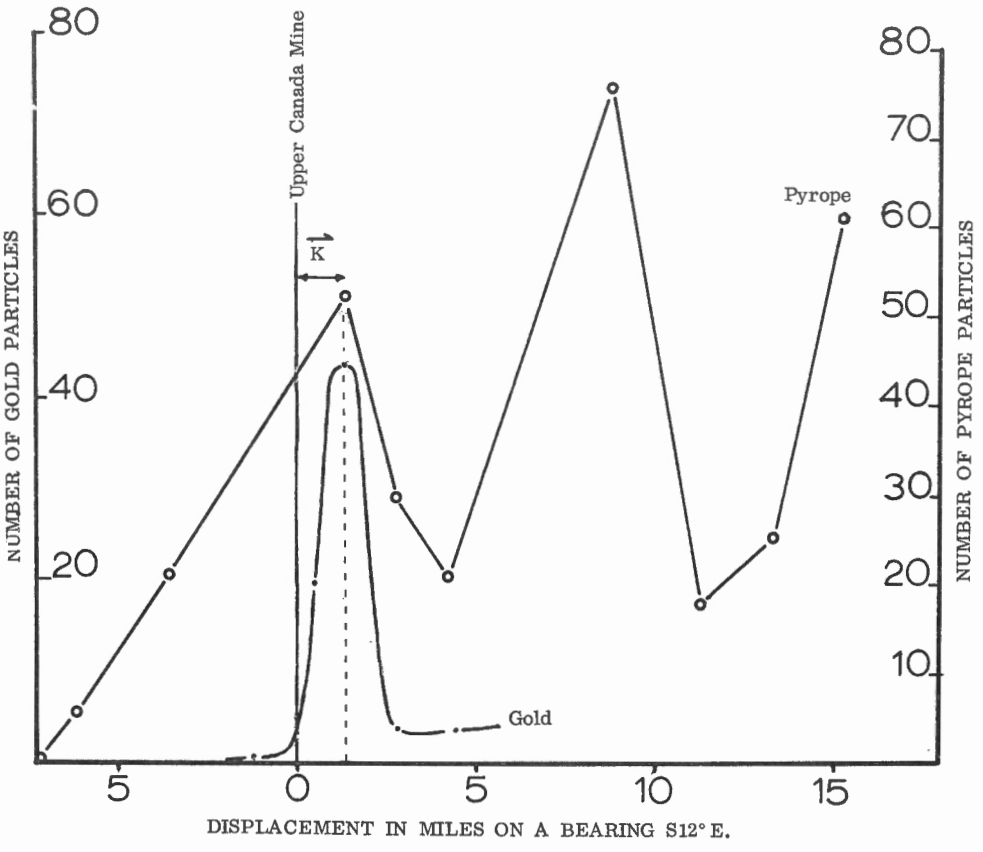

Figure 1. Distribution curves showing displacement-vector ($\vec{K}$) from bedrock source: Gold, larger than 10 microns, concentrated from 1.3 cu. ft. bulk sample; Pyrope, 0.5 to 1.23 mm, sized-concentrate from 1.3 cu. ft. bulk sample. Pyrope counts computed to 0.5 cu. ft. volume of the sized-concentrate.

As no occurrences of a pyrope-bearing rock were known in the vicinity, the writer carried out a search in the source area which was inferred from glaciofocus. The search, which has included detailed laboratory study of the most promising rocks, led to the discovery of pyrope garnet in the dyke of the Upper Canada Mine and to the eventual classification of the dyke rock as kimberlite.

It should be noted that only the most northerly point of high pyrope concentration has been related to a bedrock source. As kimberlite bodies characteristically occur in groups, the writer is of the opinion that other kimberlite bodies

probably are present in the region and can be inferred from the several pyrope peaks shown in Figure 1.

ACKNOWLEDGMENTS

The writer is greatly indebted to field men and officials of the Upper Canada Mines, Limited, for open discussion of the geology of the mine and help in obtaining samples. Mr. Gordon Bragg assisted in the actual discovery of the kimberlite dyke.

REFERENCES

Dawson, J. B.
1967: A review of the geology of kimberlite; in Ultramafic and related rocks, editor P. J. Wyllie, New York, John Wiley and Sons.

Lee, H. A.
1964: Glacial fans in till from the Kirkland Lake fault – a method of exploration; Can. Mining J., vol. 85, No. 4, pp. 94-95.

1965: Investigation of eskers for mineral exploration; Geol. Surv. Can., Paper 65-14, pp. 1-17.

1966: Glaciofocus; Queen's Printer, Ottawa.

1967: Glaciofocus research; in Report of Activities, Part A - May to October, 1966, Geol. Surv. Can., Paper 67-1, Pt. A, p. 149.

1968: Glaciofocus and the Munro esker of northern Ontario; in Report of activities, Part A - May to October, 1967, Geol. Surv. Can., Paper 68-1, Pt. A, p. 173.

Lee, H. A., and Lawrence, D. E.
-- A new occurrence of kimberlite in Gauthier Township, Ontario, Geol. Surv. Can., Paper (in preparation).

Wanless, R. K., Stevens, R. D., Lachance, G. R., and Edmonds, C. M.
1968: Age determinations by the Geological Survey of Canada. Report 8, Isotopic Ages; Geol. Surv. Can., Paper (in preparation).