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FURTHER STUDY OF GARNET XENOCRYSTS IN NEW YORK CITY MIGMATITES

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ABSTRACT

The authors have previously published an article at the 2004 Geological Society of America Annual Meeting, *Petrogenetic Significance of Garnets in the Bedrock of New York City*, in which they suggested that the garnet xenocrysts observed in the quartzo-felspathic zones of the migmatites, so frequently seen both at the surface, and below the surface pursuant to the construction of the Manhattan portion of New York City Water Tunnel #3, were a refractory residue of the anatectic melting of the immediately surrounding schistose bedrock. Although the relatively high melting point temperature of garnet compared to other minerals in the surrounding schists and schistose gneiss supports this suggestion, subsequent analysis of the composition of the representative garnets in the pegmatitic zone of the migmatites and schistose gneiss shows that they are quite different from the garnets in the immediately surrounding bedrock. This implies that the garnets in the quartzo-felspathic portions of the migmatites were not derived from the bedrock immediately adjacent to them. Further study of garnetiferous bedrock in the area, specifically for the composition of the garnets, could reveal the source rocks of the garnets. This is a project that students could be involved in and which we intend to pursue.

Discussion and Conclusions

The composition of the Garnets in the pegmatite intruded into the schistose gneiss observed during the Manhattan phase of the construction of New York City Water Tunnel #3 differs significantly from that of the schistose gneiss enclosing and in contact with the pegmatite. These differences can not be attributed to diffusion because the garnets in the pegmatites are richer in some metals that the pegmatite does not contain significant concentrations of, specifically magnesium. Therefore, we conclude that the garnets in the pegmatites did not come from the immediately surrounding schistose gneiss. We conclude that the pegmatites were generated from source rocks not in contact with them where they were observed. This, in turn, suggests that we look at other garnetiferous rocks in the area and analyze the garnets in them to see if we can identify a good match with the garnets in the pegmatites studied in the tunnel rocks. This would be a good project for our geology students to participate. We plan to initiate such a study.

Analysis of Garnets

Oxide (%)	Garnet from the Schistose Gneiss (N=10)	Garnet from the Pegmatite (N=10)
SiO ₂	36.00	39.00
TiO ₂	0.12	0.02
Al ₂ O ₃	19.75	22.12
Fe ₂ O ₃	1.05	0.10
*FeO	30.65	32.70
MnO	1.65	0.55
*MgO	1.05	5.35
*CaO	9.25	1.45

Figure 1

Core with garnet in pegmatite.

Figure 3

Schistose rock in Manhattan Water Tunnel containing large garnet crystals.

Garnet from the Schist: Darker and richer in Ferric Iron, Titanium and CaO.

Garnet from the Pegmatite: Lighter and richer in MgO.

Figure 2

Sectioned core with garnets in pegmatite.

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