

# A RADIOMETRIC AND CHEMICAL STUDY OF THE BINARY FITZWILLIAM GRANITE OF NEW HAMPSHIRE

by

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## ABSTRACT

The radioactive elements in a 1000-foot core of Fitzwilliam Granite from New Hampshire were measured with a laboratory gamma-ray spectrometer. Averages of 23. (4) p.p.m. uranium, 7.6 p.p.m. thorium, and 4.0 percent potassium were found. A high abundance of uranium was found in that core showing silicic pegmatitic material, and a deficiency of uranium was found in the upper 400 feet as a result of leaching; thorium was enriched in the altered section.

Three pairs of coexisting muscovites and biotites were analyzed for thorium and uranium. In each case, a greater thorium-to-uranium ratio was observed in the biotite. Biotite was found to contain one-third of the whole-rock thorium and most of the thorium concentrated in the micas. One-half of the uranium of the pegmatitic portions (two of the samples) was concentrated in the biotite. In one of the three pairs of micas, a composite of 20 samples throughout the core, one-sixth of the total whole-rock uranium and three quarters of the uranium in the micas was found in the muscovite.

Twenty-four samples of granite and 17 pairs of muscovite and biotite were analyzed for lithium, sodium and potassium, rubidium, magnesium, calcium, strontium, barium, titanium, chromium, manganese, iron, cobalt, nickel, copper, and zinc by use of absorption flame photometric and absorption spectrometric means.

Alteration by solutions permeating through numerous fractures in the granite is characterized by leaching of only lithium, uranium, silicon and/or aluminum, with marked enrichment of sodium, potassium, manganese, strontium, barium, cobalt, nickel, zinc, and possibly rubidium and titanium; calcium, magnesium, iron, and copper remain steady. Variability in the analyses of the whole rock and the mineral separates is attributed to: 1) alteration, 2) metasomatism with associated pegmatitic veins which cause 3) a typical mineralogy.