The unique feature of the 'Mottled Zone' mineralization is the occurrence of high-temperature minerals and of secondary minerals derived from them in a sedimentary sequence unaffected by either contact or regional metamorphism. Contact metamorphism is excluded by field evidence, as well as by the constant stratigraphic position of those deposits at various places; the tectonic position of the formation in areas where folding is absent or very slight excludes regional metamorphism. Moreover, the calcite–spurrite formation in one of the localities here described, though heavily eroded, extends over an area of 5 × 8 km and reaches a thickness of up to 80 m, in contrast with the occurrence so far known where rocks carrying these minerals are generally confined to narrow contact zones.

The mechanism by which these minerals developed in the sedimentary environment of the 'Mottled Zone' is now being examined. It is tentatively suggested that the energy required for the formation of the high-temperature silicates was in this case supplied not externally from magmatic sources, but internally by subsurface oxidation of organic matter and sulphides, both of which were abundant in the original rock. This process might be compared to the spontaneous combustion of artificial slag heaps, also known as coal tips.

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[1] Bentor, Y. K., Gross, S., and Heller, L., *Amer. Min.* (in the press).
[2] Murdoch, J., *Amer. Min.*, **46**, 245 (1961).
[3] Tilley, C. E., and Harwood, H. F., *Min. Mag.*, **22**, 439 (1931).
[4] Tilley, C. E., *Min. Mag.*, **23**, 419 (1933).
[5] McConnell, J. D., *Min. Mag.*, **30**, 293 (1954); **31**, 798, 801 (1958).
[6] McConnell, J. D. C., *Min. Mag.*, **32**, 535 (1960).
[7] Hurlbut, C. S., and Baum, J. L., *Amer. Min.*, **45**, 1137 (1960).
[8] Hentschel, G., *Fortschr. Min.*, **39**, 345 (1961).
[9] Knill, D. C., *Min. Mag.*, **32**, 416 (1960).
[10] Minguzzi, C., *Periodico Mineral.*, **8**, 5 (1937).

Ngurumanite, a New Hypabyssal Alkaline Rock from Kenya

IN June 1959, E. P. Saggerson and B. H. Baker of the Geological Survey of Kenya discovered a number of small alkaline intrusions in upper Tertiary lavas on the Nguruman Escarpment, which forms the western wall of the Rift Valley about seventy miles south west of Nairobi. During a detailed examination of these intrusions in 1960, we found the alkaline rocks to be emplaced in a flow of ankaratrite (biotite-olivine melanephelinite), that is evidently intercalated in more common olivine basalts. The intrusions, which are probably of upper Tertiary age, are closely controlled by two north–south vertical fault zones in the ankaratrite. Narrow dykes feed sills about 2 ft. thick and these thin rapidly into an intricate network of veins.

The medium- to coarse-grained intrusive rocks consist largely of pyroxene and altered nepheline and are thus somewhat similar to many melteigites: they differ radically, however, in containing an iron-rich mesostasis and numerous vug-like segregations of zeolites and calcite. The combination of these unusual features has led us to propose a new rock name, 'ngurumanite', given after the Nguruman Escarpment where the rock was discovered.

Although most of the ngurumanite is distinctly red-brown, thin green veins of similar composition also occur, field relationships showing that the greenish intrusions were emplaced after red varieties. The close spatial relationship and the similarity in mineral and chemical composition of the ngurumanites and host ankaratrite strongly suggest that all the rocks were derived from a common magma and that ngurumanite can be considered a hypabyssal equivalent of the ankaratrite. Lacroix has described other hypabyssal equivalents of ankaratrites, though the Kenya rocks lack the felspar, biotite, hornblende and olivine of tamaraïte[1] and felspar, biotite and olivine of fasinite[2].

A full description of the rocks and their petrogenetic significance will appear elsewhere. Meanwhile, we thank the Commissioner of Mines and Geology, Kenya, for permission to publish this article.

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[1] Lacroix, A., *C.R. Acad. Sci., Paris*, **166**, 543 (1918).
[2] Lacroix, A., *Minéralogie de Madagascar*, **3**, 65 (1923).

GEOCHEMISTRY

Comparative Uranium and Thorium Analyses of Basic and Ultra-basic Rocks

RECENTLY a number of new analyses using neutron activation and isotope dilution techniques have been reported for uranium and thorium in certain basic rocks (that is, eclogites) and ultra-basic rocks (that is, peridotites and dunites) which are variously considered to represent materials forming the Earth's upper mantle[1,2]. In view of the significance of these results with respect to the radioactive generation of heat in the upper mantle, it is of some importance to establish the interrelation of the results reported by the various workers interested in the problem of the determination of low-level uranium and thorium abundances in rocks.

Tilton *et al.* have variously reported uranium abundances (using both isotope dilution and neutron activation techniques) and thorium abundances (using only isotope dilution techniques) in both basic and ultra-basic rocks[2–4]. Through the courtesy of Dr. Tilton and Dr. Reed aliquots of the samples of four of the rocks analysed by them were made available to us for the simultaneous determination of uranium and thorium by a neutron activation technique described elsewhere[5]. Of the four rocks analysed here, two are of basic composition (the Hualalai basalt and the eclogite from Salt Lake Crater) and two are of ultra-basic composition (the Twin Sisters dunite and the Gila dunite nodule).

Basalt, Hualalai, Hawaii. Probably as a result of the relatively high levels of uranium and thorium existing in this rock, together with the high state of homogeneity of the sample, there is extremely good agreement between values reported previously and our results.

Pyroxene-rich Eclogite, Salt Lake Crater, Hawaii. Tilton and Reed[2] have reported that the rock used for this sample was contaminated with carbonate. However, they removed this carbonate by leaching the rock powder in hot 4 N hydrochloric acid for 30 min and determined uranium in the leachings as well as uranium and thorium in the leached rock. The rock samples analysed in the work recorded here were similarly leached with hot 4 N hydrochloric acid, and 4·8 and 4·0 per cent respectively of each sample were found to be soluble. The thorium content of the leachings was determined but the uranium analyses were unfortunately lost. The uranium content of the leached rock was found to be identical with that reported by Tilton and Reed, but our thorium figure is some 26 per cent higher than their value. We have previously analysed an olivine eclogite nodule (*R*419) also from the Salt Lake Crater and found 0·042 p.p.m. uranium and 0·10 p.p.m. thorium[1]. At that time it was pointed out that the thorium/uranium ratio for this oceanic eclogite was 2·4 and lower than the range for eclogites