LETTERS TO THE EDITORS

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Age Measurements on a Pegmatitic Mica from the Rhodesian Shield

In the course of a series of determinations by the rubidium-87 → strontium-87 method of the ages of pegmatitic micas, it has been found that the method of separating and sampling such materials involves a possible source of error which we feel should be known to workers in this field and to those who prepare and select material for them. The effect is illustrated by measurements on a lepidolite from Pope's Claim, near Salisbury, Southern Rhodesia, of which the hand sample consists of a roughly elliptical 'book' of mica with axes 6 in. and 4 in. and 1½ in. thick. The book contains three sharply differentiated types of mica: (*a*) purple biaxial ($2V \approx 30°$), (*b*) greenish-white biaxial ($2V \approx 40°$) and (*c*) purple uniaxial. The uniaxial mica lies between the two biaxial forms and in two isolated patches at the edge of the hand sample. The boundaries between the micas are perpendicular to the plane of the mica sheets and penetrate the full thickness of the book.

Subsamples from the three zones, after the rejection of a few outer sheets, were weighed and dissolved in hydrofluoric acid and perchloric acid and made up as standard solutions of 100 c.c. in approximately 3 *N* hydrochloric acid. The concentrations of rubidium-87 and radiogenic strontium-87 were then determined by solid-source mass-spectrometric measurements on aliquot portions of these solutions using isotope dilution techniques. The mass spectrometer resolution was in all cases around 200. The methods of separation of rubidium and strontium were based on those described by Aldrich *et al.*[1] and will be described in detail elsewhere. Care was taken to avoid contamination and to obtain the highest accuracy from the isotope dilution method.

The concentrations of rubidium-87 and radiogenic strontium-87 found in the three types of mica are given in Table 1 and show a wide variation. The ages found from them are, however, all in satisfactory agreement and confirm the great age previously found by this method and others for the Rhodesian Shield.

It is clear that if the necessary four determinations of the rubidium-87 and radiogenic strontium-87 contents and isotopic abundances of this material had not been made on the same separated subsamples of *a*, *b* and *c* the age results might have been very much in error. Even crushed and well-mixed samples of the 'book' as a whole would have to be quite homogeneous to ensure that no great spread occurred in the results. The errors expressed in these ages have been evaluated so as to give the maximum range of the determinations made. On other rocks there are indications of the need for a full statistical examination before a true significance can be attached to individual ages, and this study is now in progress.

Table 1. Hand Sample from Pope's Claim, near Salisbury, Southern Rhodesia

Mica	$\left(\frac{^{87}Sr}{Total\ Sr}\right)_{rock}$	$^{87}Rb_0$ (mgm./gm.)	$^{87}Sr^*$ (μgm./gm.)	Age in years $\times 10^{-9}$
(*a*) Purple biaxial	0·952	8·99	266	$2{\cdot}69^{+0{\cdot}115}_{-0{\cdot}061}$
(*b*) Green biaxial	0·713	4·77	148	$2{\cdot}82^{+0{\cdot}053}_{-0{\cdot}118}$
(*c*) Purple uniaxial	0·986	7·12	201	2·57

We should also like to direct attention to a point of importance in the use of isotope dilution methods. Any small error, whether due to contamination or to measurement, may be reflected as a large error in the derived age if the relative amounts of rock and added isotopic diluent are not carefully chosen. This choice will depend upon the isotopic abundances in the rock and added diluent, and the particular isotopic ratios chosen for finding the concentrations.

Finally, it may be pointed out that the results in Table 1 show that if ionic migration has taken place in this material, it has been such as to preserve the same ratio of rubidium-87 to radiogenic strontium in all three zones, which seems unlikely.

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G. D. L. Schreiner
R. T. Jamieson
B. F. J. Schonland*

Nuffield Geochemical Unit,
Bernard Price Institute
for Geophysical Research,
University of the Witwatersrand,
Johannesburg. Jan. 18.

* Present address: Atomic Energy Research Establishment, Harwell.

[1] Aldrich, L. T., Doak, J. B., and Davis, G. L., *Amer. J. Sci.*, 251, 377 (1953).

Origin of Nickel in Deep-Sea Sediments

Pettersson and Rotschi[1] have suggested that cosmic dust may be in part the source of the nickel found in Pacific deep-sea cores. In these cores nickel occurs in amounts up to 0·08 per cent, and it was stressed that this is considerably higher than the average value of 0·008 per cent given by Sandell and Goldich[2] for the uppermost crust of the earth. Öpik[3] concurred with the view that the nickel is largely of cosmic origin, and concluded that the "zodiacal light as interpreted by van de Hulst[4], and the cosmic nickel revealed by the Swedish Deep-Sea Expedition are produced mainly by primordial dust of the solar system spiralling towards the sun in orbits which are nearly circular". Buddhue[5] estimated from the amounts of cosmic dust brought down by rain that the annual fall of magnetic particles over the earth's surface is 35–70 × 10^6 kgm., while Norris and Hogg[6], from the weight of magnetic particles falling on trays exposed in north-west Canada, state that the annual fall per square kilometre amounts to less than half a kilogram. Support[3] for a cosmic origin of nickel was also given by the similarity between van de Hulst's figure for the space density of the zodiacal light cloud of primordial dust and that required to account for the nickel content of deep-sea clays.

Pettersson and Rotschi were careful to point out that confirmation of meteoritic origin of the nickel in deep-sea sediments was necessary, and suggested that this might be obtained if an analysis for the platinum metals could be made in these sediments.

Although we have detected palladium, using a radioactivation method, even in some Atlantic globigerina ooze samples, its presence does not in