

CORRESPONDENCE

ORIGIN OF ALBITE PORPHYROBLASTS

SIR,—In his letter on this subject in the May–June number of this *Magazine*, Dr. A. F. Trendall is in error in supposing that Dr. K. A. Jones (*Geol. Mag.*, 98, p. 43) has confused his (Trendall's) view with that of Reynolds in the sentence "The origin of the porphyroblasts was considered by Trendall to be due to a soda metasomatism, possibly from a trondhjemitic magmatic source". In my 1942 paper on albite-schists to which Dr. Jones referred, the petrochemical evidence I recorded led me to conclude that "If the process of introduction of Na and Si, reinforced by Ca . . . concomitant with driving out of K, Fe, Mg, and Al had continued, the albite-schists would eventually have attained the composition of trondhjemite". On the basis of previously recorded experiences, both of my own and of other investigators, I suggested that trondhjemite evolved in this way might become rheomorphic. I have never, in fact, considered trondhjemite magma to be the source of the soda.

For nearly thirty years I have vigorously combated the view that granitic magma is the cause of feldspathization. During this time, all the evidence I have observed and recorded, as well as the evidence I have read about, has led me to think that magma of granitic composition is formed from older rocks as an end-stage of metasomatic change when accompanied by rising temperature.

Dr. Jones' misrepresentation of Dr. Trendall's conclusions, and Dr. Trendall's misrepresentation of my conclusions are, unfortunately, but a minor symptom of a widespread malaise of geological writings of the present time. It therefore behoves us all to keep in mind Josh Billings' conclusion that "the trouble with most folks is not so much their ignorance as their knowing so many things which ain't so". In our enthusiasm, however, do not let us forget that it was neither Reynolds (1942), nor Trendall (1953) nor Jones (1961) who first recognized that the albite-schists under discussion result from a large-scale impregnation of sodium, and that the growth of the albite porphyroblasts was commonly post-tectonic. The honours go to Clough (1897).

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3rd July, 1961.
- DORIS L. REYNOLDS.

AN OLIVINE-BEARING HORNFELS FROM SOUTH-EASTERN QUEENSLAND—A CORRECTION

SIR,—Since publication in 1959 of my paper "An Olivine-bearing Hornfels from South-Eastern Queensland" (*Geol. Mag.*, 96, 377–384) new evidence has made possible a more satisfactory interpretation of some puzzling features of the petrogenesis. An important problem raised in the paper was the origin and nature of the rock which was contact metamorphosed to give an olivine-bearing hornfels. At that time, from microscopic work, I could see no alternative to calling it a "basic argillite". Apart from the difficulties arising from the fine grain-size of the rock, this idea developed by taking the rather oversimplified view that the Neranleigh-Fernvale Group consisted mainly of shales and greywackes coupled with the generally accepted view that basic volcanic rocks are absent from this Group except in the Brookfield area, some

twelve miles to the south. Hence I wrote, "In this area there are no known earlier basalts which could have formed the hornfels" (p. 382).

A few months ago the area was visited by Professor Allan F. Wilson in my company and he recognized criteria for deformed pillow lavas within 20 feet of the contact with the gabbro. Moreover, the pillows are associated in several places with the typical calcic inter-pillow "sludge". Laminated rocks are also present and in such a sequence they are now thought to be basic tuffaceous sediments. The whole assemblage of pillows, their calcic interpillow material and the tuffaceous sediments has suffered some deformation prior to the intrusion of the gabbro. Some pillows are drawn out into elongate ellipsoidal bodies and some of the calcic interpillow material has migrated and transgressed the metavolcanic sequence. It was this pre-gabbro metamorphism, together with the presence of the laminated rocks, which helped to make me think only of a sedimentary and not a basic igneous origin for the hornfels.

In view of the new field evidence, the mode of origin of the olivine-bearing hornfels becomes reasonably acceptable. It was formed by the contact metamorphism of a deformed basic lava, not of a "basic argillite".

The chemical analyses published in the original paper now take on added significance. The analysis of the basic argillite (Phillips, 1959, Table 1, No. 3) is now considered to be that of portion of a metamorphosed basic pillow lava and the C.I.P.W. norm upholds this interpretation (see this letter, Table 1,

TABLE 1

	1	2
SiO ₂	47.68	44.66
TiO ₂	0.64	1.22
Al ₂ O ₃	17.21	16.62
Fe ₂ O ₃	4.52	4.02
FeO	6.64	7.18
MnO	0.11	0.14
MgO	7.11	12.35
CaO	12.94	10.36
Na ₂ O	1.74	1.72
K ₂ O	0.44	0.46
H ₂ O + 110° C	0.89	1.15
H ₂ O - 110° C	0.09	0.05
CO ₂	Nil	Nil
P ₂ O ₅	0.07	0.16
	100.08	100.09

Norms.

or		2.8	2.8
ab		14.7	14.2
an		37.8	36.4
di	{ wo	10.7	6.0
	{ en	6.9	4.3
	{ fs	3.0	1.2
hy	{ en	10.2	5.7
	{ of	4.4	1.5
ol	{ fo	0.4	14.4
	{ fa	0.2	4.3
mt		6.5	5.8
il		1.2	2.3
ap		0.3	0.3

1. Deformed basic lava from 150 yards west of the contact with gabbro, Cedar Creek at 917084 Samford Sheet. Earlier interpreted as the "basic argillite" (Phillips, 1959, Table 1, No. 3). Analyst—W. H. Herdsman.

2. Olivine-bearing hornfels at the contact with gabbro at 917084 Samford Sheet. Analyst—W. H. Herdsman.

No. 1). The analysis and C.I.P.W. norm of the "argillite" are similar to, but differ in certain respects from, the analysis and C.I.P.W. norm of the olivine-bearing hornfels (see Phillips, 1959, Table 1, No. 4, and this letter Table 1, No. 2). The composition differs, however, no more than one would expect a portion of a pillow (perhaps slightly contaminated with migrating interpillow calcic material) to differ from a more fortuitously selected sample of basic rock collected some 150 yards across the strike of a basic meta-volcanic succession. Because of this, the idea that the contact metamorphism was practically isochemical is still the favoured hypothesis, and because of the new field evidence the relationship between hornfels and source rocks is a much simpler and more credible one.

Finally, I would like to say that at all times Associate Professor J. F. G. Wilkinson of the University of New England, thought from chemical evidence, without having seen the contact area, that the hornfels had been formed from some kind of basaltic rock, and I would like to thank him and Professor Wilson for the help they have given me.

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REFERENCE

PHILLIPS, E. R., 1959. An Olivine-bearing Hornfels from South-Eastern Queensland. *Geol. Mag.*, **96**, 377-384.

AN EARLY REFERENCE TO ISOSTASY

SIR,—The "Examination of Dr. Woodward's Account of the Deluge etc." is a rare pamphlet written by Dr. J. Arbuthnott and printed in London in 1697. The result of this "Examination" was very unfavourable to Dr. Woodward. In elegant language Arbuthnott, renowned wit, accomplished satirist and collaborator with Pope, Swift, and Gay, utterly demolished Woodward's edifice.

It will be remembered that, notwithstanding a denial of his obligation to postulate the origin of the waters of the Flood, Woodward did in fact claim that it came out of an internal cavity or abyss at the centre of the earth. It was this vacant hollow which excited Arbuthnott's interest. Nor is this surprising when we recall that this space had to remain empty until it was roofed by the reformed solid crust and to provide the receptacle into which the flood waters were to descend again when they had completed their business of temporarily transforming the earth into a thick suspension of earthy matter.

By a straightforward calculation based upon the reasonable assumption that there would be required at least a bulk of water equal to that of solid matter if any reasonable degree of fluidity of the mixture was to be achieved, Arbuthnott computed that the volume of water needed would envelop the earth to a depth of 450 miles. This quantity of water would occupy a sphere of 5,000 miles diameter with a centre coincident with that of the earth. Had he taken the modern estimate of the earth's radius in place of the then current figure of 3,600 miles his figures would have been increased by some 10 per cent.

The difficulties attendant upon the support of a liquid shell above an empty space naturally occurred to Arbuthnott, but what is more interesting is what he has to say about a solid carapace arching over such a vacuity. It is necessary, however, to grant him what he did not specifically claim, namely that his remarks would apply equally had this space been filled with a heavy fluid. Now, Woodward had interpreted horizontal planes of stratification as interfaces between concentric shells of materials of increasing density towards