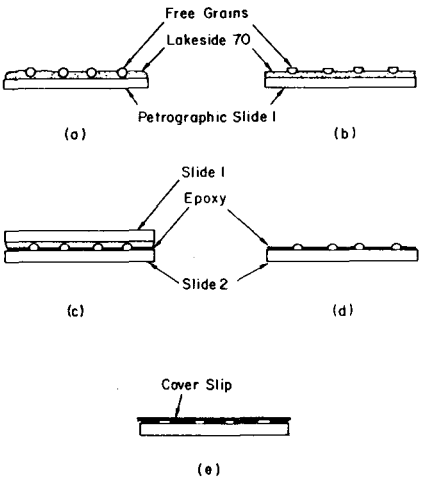

FIG. 1.–Illustration of sequential steps for making thin sections of free grains with two mounting mediums.

The grains are first mounted on a glass petrographic slide in a smear of Lakeside 70 which has been heated to approximately 120°C (Fig. 1*a*). After the sample has set, it is ground to a flat, smooth surface which transects the broadest central section of the majority of the grains (Fig. 1*b*). This flat and semi-polished surface is mounted on a second petrographic slide which has been smeared with hot epoxy and its hardening agent (Fig. 1*c*). Heating the epoxy to approximately 100°C makes the smear more liquid and hence facilitates removing bubbles. The heating also encourages the mounting medium to set in as little as 6 hours. The sample, which is sandwiched between two slides, is allowed to cure overnight. On the following day it is placed on a hot plate and heated to 120°C. At this temperature, the Lakeside will melt, but the epoxy remains set and the first glass slide can be removed (Fig. 1*d*). The exposed slide is then ground to the desired thickness and a cover slip finally adhered to the exposed surface if so desired (Fig. 1*e*).

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17th June, 1969.

ARDNAMURCHAN CENTRE 1–DOES IT NEED RE-DEFINING?

SIR,–We were recently able to examine some of the main features of the Ardnamurchan ring complexes, and felt that certain field relationships seemed incompatible with portions of the established sequence, particularly in regard to Centre 1.

The purpose of this letter is to air our reservations, in hopes of drawing informed comment from persons with greater experience of the region.

Our main concern is the Ben Hiant volcano, in the eroded vents of which are exposed agglomerates and layered tuffs (sub-aerially deposited?), and pitchstone lavas. The

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latter were by definition deposited upon a land surface, which is now about 300 m above sea level and some 30–60 m below the present summits of Bheinn na Seilg and Meall Meadhoin, formed of Centre 2 and 3 gabbros. We find it difficult to envisage how, assuming negligible differential movement, an *older* land surface can be preserved at a *lower* topographic level than *younger* plutonic rocks, which must have solidified beneath at least a thousand metres of domed overburden (Richey & Thomas, 1930, p. 178). Furthermore, the Ben Hiant dolerite vent-filling cuts the agglomerates and tuffs. Its summit is at least 100 metres higher than those of the gabbros. So it must have solidified at similar depths, if it is indeed older than the gabbros, yet it is relatively much finer grained.

The cross-section, Fig. 3 in Richey, 1940 (also Fig. 36 in Richey, 1961) illustrates our problem; and we suggest it is at least plausible that the Ben Hiant vents, shown with flared shape suggesting shallow depth, were younger than the Centre 2 and 3 activity. In short, the Ben Hiant event could be a late flank eruption, analagous to those round many modern caldera complexes. On this interpretation, the more indurated agglomerates at Faskadale and Glas Eilean would be low level exposures through older and deeper breccia pipes, Glas Eilean being a flank eruption to Centre 2.

It seems also, from the published descriptions, that intersecting relationships for cone sheets of Centres 1 and 2 are nowhere well exposed. In view of this and of the mapped distribution of cone sheets outside the eastern limit of Centre 2, plus the overall petrographic similarity of cone sheets in the area as a whole, we feel that the proposed configuration of Centre 1, as given in Plate II of the 1930 Ardnamurchan Memoir, is open to question.

Pre-Centre 2 rocks demonstrably exist, of course, and we do not intend to cast doubt on the possible existence of an early centre. But we do question whether Ben Hiant, and perhaps the eastern belt of the so-called Northern Vents and their cone sheets, constitute a part of it.

These questions are based on only a 4-day visit to Ardnamurchan, on an IAVCEI field excursion, and we fully realise that this does not constitute familiarity with the geology–although we did supplement our observations by discussion with excursion leaders and other members of the party. We are especially grateful to Dr. Maurice Wells (who is not necessarily in agreement with our views) for his helpful comments and for providing many of the references listed below, all of which we consulted, although only three are cited above.

We look forward to the answers to our questions.

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Postscript. Since compiling this letter we have been fortunate to hear both the excellent review lecture by Prof. G. M. Brown on Hebridean vulcanism, and the paper by J. G. Holland and Professor Brown, on the geochemistry and petrogenesis of the Ardnamurchan cone sheets, both presented at the IAVCEI Symposium sessions at Oxford.

The paper by Holland and Brown was of particular interest to us, in relation to this enquiry. Their work shows that the cone sheets of Richey & Thomas' Centre 1, plus those of Centre 2 near Mingary, are the most silicic. That is to say, according to classic differentiation theory, the latest differentiates are all in the region which we suggest may include the youngest members of the Ardnamurchan complex.

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THE BASEMENT BEDS IN THE BOBBING BOREHOLE, KENT

SIR,–No Ordovician rocks have hitherto been recorded from south-east England.

Working independently on the macrofaunas and palynology of the concealed Lower Palaeozoic rocks beneath the Kent coalfield, we have examined material from the Bobbing Borehole. This borehole, drilled in 1911 two and a half miles (4 km) west-north-west of Sittingbourne, Kent, [NGR TQ/874 652] encountered (unconformably beneath the Great Oolite) steeply dipping basement rocks at a depth of 1,192 feet (363 m), about–1,070 O.D., and was stopped at a depth of 1,250 feet (381 m). These basement beds are grey micaceous siltstones and sandstones, of an estimated true thickness of 20 feet (6 m), and were considered to be of Silurian age by Lamplugh, Kitchin & Pringle (1923, p. 158) and Dines, Holmes & Robbie (1954, p. 11).

The macrofauna from the Lower Palaeozoic rocks in the collection of the Geological Survey (registered numbers JM 1635–52) comprises the following:–

bryozoa
strophomenide brachiopod [two pedicle valves]
strophomenoid brachiopod [fragment]
orthocone nautiloid
homalonotid trilobite [fragment]
trinucleid? trilobite [fragment]
Plumulites sp. (see Withers 1926, p. 70)
Mastigograptus ? sp. [two specimens]
crinoids, bivalves and ?gastropod [assorted fragments]
worm burrows

We (L. R. M. C., A. W. A. R.) have assessed the age of this assemblage to be upper Ordovician for the following reasons. The doubtful trinucleid fragment suggests an Ordovician rather than a Silurian age, and the strophomenoid fragment suggests the upper rather than the lower part of the Ordovician. One trepastomatous bryozoan was originally examined by Dr. K. P. Oakley, who compared it with the Ordovician genus *Batostoma* Ulrich. The graptoloid (the "plant remains" of Dines *et al.* 1954) was kindly looked at by Professor O. M. B. Bulman, who tentatively referred it to the predominantly Ordovician "dendroid" genus *Mastigograptus* Ruedemann, a record which, if confirmed, would be the first for Britain; but the total age range of the genus is not yet definitively known.

The strophomenide brachiopod is of particular interest. There are two small convex pedicle valves, one with its counterpart, both about 4 mm. wide. The ornament is typical of many strophomenaceans, more or less equally parvicostellate with a conspicuous median rib, and this, taken together with a triangular, open-ended muscle field and perhaps vestigial dental plates, suggests attribution to *Rafinesquina* sp. On the other hand, on the hinge lines of both specimens there are what have been described as