At Os, in Norway, in the Bergen Arches, masses of Ordovician corals are slightly flattened while bands of mica schist pass through the actual coral.

In Jamaica, at Moy Hall, on approaching the serpentine at Arntully, conglomerate with limestone pebbles enclosing Rudist remains and Foraminifera occur. Patches of serpentine develop while the pebbles become reduced in size till they are mere pellets. The pebbles become impregnated from the outside inwards by green infiltration and in some pieces are drawn out into streaks but still retain fossil traces, in a sort of ophicalcite.

The wholesale removal of calcite is obvious, but I can assign no reason for it, except that the process is chemical and mineralogical rather than dynamical. Such contraction occurring through a considerable thickness of rock could account for local folding and thrusting as the mass becomes drawn together as it is drawn upwards.

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6th March, 1958.

ULTRABASIC PILLOW LAVAS FROM CYPRUS

SIR,—Preliminary accounts of the Troödos massif and igneous complex were given by the writer in *Nature*, 1952, and in the Transactions of the XIXth International Geological Congress (1952), published in 1954, as well as in unpublished official records. The subdivision of the massif into its main groups and the recognition of more than one series of lava flows had in fact been accomplished and demonstrated by the writer before 1953; since when the Geological Survey has been steadily continuing its investigation of the island.

It is incorrect, therefore, that in the second paragraph of his paper " Ultrabasic Pillow Lavas from Cyprus " (*Geol. Mag.*, xcv, No. 3, 1958), Mr. I. G. Gass should ascribe this early work to the present organization; while he omits my two short but fundamental papers of 1952–54 from his bibliography. In fact, the general reconnaissance of the whole area and pioneer mapping of over 250 square miles of this rough and then geologically unknown region was done by the writer (1950–53) with the assistance of Mr. R. A. M. Wilson during 1952 and the end of 1951.

There are some further points of interest which have not yet received the attention they deserve.

Mr. Gass records a difference of opinion as to whether the Diabase Formation represents a huge series of north-south dykes or a set of isoclinally-folded lava-flows. Both of my papers cited above give the evidence on which I named this formation the " Folded Diabase ", whose component sheets vary from a few centimetres to a metre or so in thickness, and whose total breadth of exposure across the strike is some 50 miles. The strike does not vary more than a few degrees either side of north and south, and is frequently north-north-west, thus lining up with the Red Sea direction. On the evidence I have interpreted the structure as a great anticlinorium of which the heart has been filled by the basic plutonic core described. There is a lot of dyke-matter intruded lit-par-lit into this diabase; but if the whole thing is a huge series of dykes in groups inclined at various angles it becomes enormously difficult to explain the structures by any theory of faulting; or the emplacement of a pack of dykes of such small thickness and huge extent like the leaves of a book. Each dyke must have had time to solidify before an adjacent one came in beside it and displaced the existing wall-rocks for dozens of miles all told. The dips of the various limbs of the supposed folds run as a rule between 45 and 60 degrees either to east or west; and the turnover at the bottom of a syncline is unusually sharp if not angular, while the slopes from valley-bottom to crest may be as uniform as a roof for several thousand feet. But this is not inconsistent with the rigid, non-plastic, competent character of the diabase which shows low-grade metamorphism.

I have not yet heard the argument counter to the folding theory and should welcome knowledge of it.

The diabase and its relationships were, however, so unusual, if not unique, that every effort was made to look elsewhere for a parallel example which might throw further light on them. The geological maps of Turkey (scale 1 : 800,000) were not particularly helpful because the older formations were so heavily covered by post-Triassic material; though they did indicate the presence of Palaeozoic and metamorphic rocks on the Turkish coast north of Cyprus. So far as could be ascertained there was no parallel in Palestine or the Sinai Peninsula; but Dubertret's map of Syria (1 : 500,000) suggests an extension on the mainland of what may be called Troödos conditions. The Qizil Dagh massif which forms the promontory of the coast north-west of Antioch shows a great central sack-shaped core of pyroxenites, peridotites, and serpentines (with some chromite) set in a wide girdle of gabbros and diorites, which are stated to grow finer in grain as their outer margin is approached. The Qizil Dagh exposes a much larger area of these rocks than is seen at Troödos, the peridotites alone covering 250 square miles. In the short explanation covering Dubertret's map, a batholithic character and a thickness of at least thousands of metres is assigned to the ultrabasic core; but there is no mention of anything comparable to the Diabase, or of andesitic or spilitic lavas surrounding the massif. I am much indebted to M. Dubertret for sending me his maps and some personal observations. He alludes to the fine grey sandy type of weathering endured by the gabbros, exactly as in Cyprus, where erosion produces rounded slopes and relatively depressed areas in contrast to the jagged outcrops of Folded Diabase, which generate a reddish-brown soil. It would seem from the description that the Troödos and the Syrian coastal plutons belong to the same province and period.

The surprising homologue of Cyprus comes from the other side of Africa: the Canary Islands, and this is the only parallel that I am aware of. One of these, Fuerteventura, was described in some detail by J. Bourcart and A. Jeremine in the *Bull. Volc.*, Series II, vol. iii, 1938. I have not visited the island, and the following are salient points from the French paper.

Geologically, the oldest rocks are Bourcart's " trapps " [*sic*], which are sheeted (" des bandes successives ") and highly folded. They include spilites, andesitic lavas, and basalts. (There is in fact some rare spilitic material in the Folded Diabase of Cyprus, in the west end of the island, as well as in the later lavas, which to my mind makes it certain that the diabase succession originated as flows.) Olivine is recorded in the " trapps ", also amphibole and epidote, which are a feature of metamorphism in the diabase of Cyprus. In Fuerteventura there is a central core of gabbro and syenite intrusive into and surrounded by these " trapps ", which antedate the plutonic core. Finally, the eroded and upturned edges of the " trapps " are overlain by basalt flows with complete unconformity: in Bourcart's words, " en totale discordance." The late flows are stated to be of post-Miocene age, but distinction is made between an earlier and a later series. No post-Miocene lava is known in Cyprus.

Both physically, geologically, and so far as is known at present petrologically, Fuerteventura is a close counterpart of the Troödos block; according to Bourcart's and Jeremine's account, their " trapps " give rise to exactly the same topography as the Folded Diabase; the figures and certainly the geological section on p. 66 of their paper might have been taken from Troödos. The geographical setting of each island in relation to the African coast is similar; the sequence and relationship of the four groups of rocks: Folded Diabase, Basic Plutonics, and discordant early and late lavas, are matched; the types are similar and there appear to be points of resemblance in metamorphsim and structure. Serpentine is not recorded at Fuerteventura; but the Canaries are less deeply eroded and contain later lavas than Cyprus.

Such a resemblance between volcanic islands off the African margin, albeit on opposite sides of the continent, seems more than fortuitous. Troödos is no longer unique. Is there an explanation common to both? Are we looking at isolated scraps of a regional phenomenon generally concealed by the sea around the continental margin ? In view of the very large positive gravity anomaly known in Cyprus, it would be of great interest to get observations from Qizil Dagh and the Canaries and compare them.

The formation of pillow-lavas seems to mean no more than the discharge of a flow into the sea, not necessarily into deep water; on the northern side of the Troödos there is certainly one example of a flow a few feet thick with marked columnar jointing merging into pillows without jointing, presumably as it moved off-shore.

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22nd July, 1958.

PELAGIC FORAMINIFERA IN THE TERTIARY OF VICTORIA

SIR,—I was extremely interested to read the recent account (July–August, 1958) by Alan Carter of the planktonic foraminifera of the Victorian Tertiary.

For the last two years I have been working on foraminifera from a 1,200 ft. sequence of marine rocks from the Lakes Entrance Oil Shaft, Gippsland, Victoria. Samples were collected at every 4 feet, below 212 feet, by Miss I. Crespin, and were made available to me by the Bureau of Mineral Resources, Canberra.

I would like to comment on some of the ranges of some of the foraminifera referred to in Carter's paper and compare them briefly with those found in the shaft.

(1) The initial appearance of *Globigerina ciperoensis ciperoensis* Bolli is 64 feet above that of *Globoquadrina dehiscens* (Chapman, Parr, and Collins) and its extinction is 172 feet before the initial appearance of *Orbulina universa* d'Orbigny. It seems, therefore, to have a shorter range than that indicated in his Table 1 (p. 299), more comparable to that recorded in Trinidad (Bolli, 1957). The subspecies *Globigerina ciperoensis angustisuturalis* Bolli has a still shorter range.

(2) *Globigerinoides bispherica* Todd appears 172 feet after the initial appearance of *Globigerinoides triloba* Reuss, and 64 feet before that of *Orbulina universa* d'Orbigny. Again, it is suggested that this species has a much shorter range than Dr. Carter indicates. It is sometimes confused with the large forms of *Globigerinoides triloba* Reuss *immatura* Le Roy, but the emended description of Blow (1956) does help in its diagnosis.

(3) *Globigerina ampliapertura* Bolli is found before the appearance of *Globigerina ciperoensis ciperoensis* Bolli, and prior to the publication of Bolli's paper (1957) this Upper Oligocene/Lower Miocene form was called *Globigerina apertura* Cushman. This latter name is now restricted to forms which occur in the Middle and Upper Miocene only.

(4) *Globigerinoides rubra* d'Orbigny is very rare, occurring in only four samples scattered over 144 feet.

(5) *Orbulina universa* d'Orbigny appears 20 feet after *Candorbulina universa* Jedlitschka (= *Orbulina suturalis* Bronnimann) and *Orbulina bilobata* (d'Orbigny) (= *Biorbulina bilobata* Blow) 12 feet later. Blow's (1956) evolutionary series is present in all its detail and it may be of some interest to note that the evolution of *Orbulina universa* d'Orbigny from *Globigerinoides triloba* (Reuss) takes place in 236 feet of marly Bryozal limestone.

(6) *Globorotalia barisaensis* Le Roy occurs, but the keeled *Globorotalia fohsi* lineage is not present, which seems to confirm Carter's views (p. 302). Probable specimens of *Catapsydrax dissimilis* (Cushman and Bermudez) and *Globigerinatella insueta* Cushman and Stainforth occur in the lower part of the shaft but are too rare to be considered as zone fossils. The important fact is that their ranges seem to correspond to those in Trinidad (Bolli, 1957).

It is hoped to publish shortly a detailed account of the ranges of some