CORRESPONDENCE

THE CARBONIFEROUS UPLAND FLORA

SIR,—Mr. R. Neves is to be congratulated on his paper (1958) on the spores of an Upper Carboniferous coal and its associated shales, which throws new light on a relatively unknown aspect of the Carboniferous flora. Mr. Neves shows that there is a striking abundance of pollen of the type produced by cordaites and conifers in his marine shale, in contrast to the associated coal and non-marine shale, where this pollen is a relatively trivial element. He also suggests that this is the case in other Carboniferous marine deposits. I believe that the implications of this are more far reaching than Mr. Neves suggests.

Spores in Carboniferous marine shale have a peculiar ecological significance in that they represent mainly the "spore rain" from what may be regarded as the permanent land of that time, in contradistinction to the spores of the swamp vegetation abundantly represented in coal. That cordaite and conifer pollen proves to be very abundant in such a marine shale is of particular interest in this context. Mr. Neves suggests that "a flora in which these plants (cordaites and conifers) abounded marginal to the marine depositional area could be envisaged as providing the high concentration of *Florinites* in the marine sediment". But the flora immediately adjacent to the marine depositional area would presumably be of the typical coal swamp type; and in this, as he shows from the coal itself, pollen of the cordaite and conifer type is a relatively trivial component.

A much simpler, and I believe more attractive, hypothesis is that the cordaite and conifer dominated vegetation was present throughout the depositional cycle in a situation practically unaffected by it—namely in the areas of higher land adjacent to the coal swamp. Before a marine invasion the spores of the lycopods, calamites, pteridosperms and ferns in the swamp in the central part of the basin would far outweigh locally the pollen rain coming from the relatively remote (if extensive) upland cordaite and conifer vegetation. When a marine inundation flooded the basin, the swamp vegetation would be temporarily displaced to a marginal belt, while that of the upland areas would be virtually unaffected. The marine mud deposited in the centre of the basin would continue to receive the same pollen rain from the uplands as before, but that from the restricted marginal swamp would now be in relatively lesser proportion. This hypothesis would explain Neves' observed abundance of *Florinites* as being a direct result of the marine phase.

An analagous situation to that postulated here occurs in the Tertiary pollen sequence in Venezuela (Kuyl *et al.*, 1955) in which changes in the pollen from the upland vegetation can be discerned against the background of locally dominant mangrove swamp vegetation which responds rapidly to minor changes in water level.

Whether this explanation of Neves' observations is valid or not, the spore contents of these marine shales are worth serious study, for these may be the only source of evidence that we shall ever have on the upland vegetation of that time. It is tempting to speculate that the true conifers, as distinct from the cordaites, may have been an important component of this upland flora during Carboniferous time long before they became a conspicuous element in the (macro-)fossil flora in the Permain. If we can learn to recognise the various Palaeozoic plants from their spores and pollen this type of palaeo-ecology holds interesting possibilities.

REFERENCES

KUYL, O. S., J. MULLER, and H. T., WATERBOLK, 1955. The application of palynology to oil geology with special reference to western Venezuela. *Geol. en Mijnbouw*, N. S. 17, 49–75.

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BOTANY DEPT., W. G. CHALONER.
UNIVERSITY COLLEGE, LONDON.
12th April, 1958.

NOTICE

UNIVERSITY OF NEW ENGLAND, ARMIDALE, N.S.W.

In February a fire at the University of New England destroyed a large percentage of the Department of Geology, including the entire Overseas Rock and Mineral collections, and the Collection of Departmental Reprints.

Whilst it has been possible to purchase selected overseas rock and mineral specimens, the bulk of the material destroyed was of a type not stocked by dealers, e.g. mineral and rock collections from particular areas possessing both teaching and research value.

The Department of Geology would be most grateful of any offers of duplicate reprints, rock and mineral collections that are of no further use to departments or individuals.

Inquiries should be addressed to : Professor A. H. Voisey, Department of Geology, The University of New England, Armidale, 5N, New South Wales.

PUBLICATIONS RECEIVED

BRITISH TERRITORIES IN BORNEO : Geological Survey Department. Mem. 8, *The Geology and Mineral Resources of the Upper Rajang and Adjacent Areas, Sarawak*. By H. J. C. KIRK. pp. xv + 181, with 29 figs., 30 tables, 53 pls., and 4 coloured maps in folder. Kuching, Sarawak, 1957. Price 21*s*.

BRITISH TERRITORIES IN BORNEO : *Annual Report of the Geological Survey for the year 1957*. By F. W. ROE. pp. x + 200, with 31 figs., 32 tables, and 43 pls. Kuching, Sarawak, 1958. Price 7*s*.

NIGERIA : *Geological Survey of Nigeria, Bull.* 27. The Geology of parts of Niger, Zaria, and Sokoto Provinces, by W. RUSS. 42 pp., with 13 plates (incl. 2 coloured maps), 2 figs., and 15 tables. Lagos, 1957, price 15*s*.

G. H. JONES. Memoria Explicativa y Mapa Geológico de la Región Oriental del Departamento de Canelones. *Instituto Geológico del Uruguay, Bol.* 34, 1956. 110 pp. with 42 pls. and folding map in colour (1 : 200,000).