Antiquity of tropical rain forests

from Peter D. Moore

IT IS often stated, and widely believed, that tropical rain forest is a vegetation type which has existed for a considerable length of geological time; some authors even suggest that no major evolutionary developments have taken place in such forests since Cretaceous times. In fact there is very little in the way of fossil evidence by which such claims can either be supported or refuted. Some new information, however, has been gleaned by Graham (*Evolution*, **29**, 723; 1976) as a result of a pollen analytical study of upper Miocene lignites from a lowland area of Coatzacoalcos, Veracruz, Mexico. A hundred and ten pollen and spore taxa have been identified from these lignites and on the basis of these identifications some comparisons can be made with modern vegetation. True tropical rain forest taxa are poorly represented as are the arid community representatives now found in the area, but instead components of oak or pine–oak forest are frequent with possibly *Picea–Abies* forest at higher altitude. Reconstruction of past communities on the basis of pollen asssemblages is, however, fraught with problems, and as Graham gives little indication of the precise location of his sampling sites, the relative abundance of different taxa, or the methods used for determining palaeocommunities, it is difficult to appraise his conclusions critically.

Quaternary palynological work from other tropical areas such as the Galapagos (Colinvaux, *Nature*, **240**, 17; 1972), South America (van der Hammen, *J. Biogeog.*, **1**, 3; 1974), and northern Australia (Kershaw, *Nature*, **251**, 222; 1974) certainly indicate that considerable changes in vegetation have occurred within the Pleistocene, though the reverse situation may obtain in certain areas, such as the Cuatro Ciénegas basin of Mexico (*Nature*, **247**, 129; 1974). It is not unreasonable to suppose, however, that changes were also proceeding within the Tertiary in some places. The vegetation of many tropical forests may have undergone adjustments in its composition, presumably in response to climatic changes, and the concept of community migration, which is so popular with temperate palaeoecologists may also have relevance in the tropical context. For example, the needle-leaved element in Graham's assemblage could represent an extension of the highland forests of Central America in response to lower temperatures.

Veblen (*Biol. Conserv.* **9**, 141; 1976) describes such forests with a high proportion of coniferous trees from the highlands of Guatemala. *Abies* and *Pinus* are present in these forests, together with *Cupressus*, *Taxus*, *Taxodium* and *Podocarpus* and these may represent relict fragments of more extensive Tertiary coniferous forests. Indeed, the abundance of species in the genus *Pinus* (29 spp.) in the area has led Mirov (*The Genus Pinus*, Ronald Press, New York; 1967) to speculate that the highland areas of Guatemala and Mexico may have been a secondary centre of evolution for the genus.

The continued existence of these conifer-rich forests in Guatemala is of more than academic interest. Veblen points out that they represent an important genetic resource which is currently being eroded by exploitation for timber. The land is subsequently used for agriculture, so that little regeneration is possible (Gomez-Pompa *et al.*, *Science*, **177**, 762; 1972). Severe genetic depletion in the forest communities is a real threat in these conditions since genetic races of various species will inevitably become extinct even where the species itself survives. Such a process must be regarded as an economic catastrophe in the long term, for these forests could supply the species so badly needed for the expansion of forestry in the tropics. So far only one of the highland Guatemalan conifers, *Cupressus lusitanica*, is used for this purpose; it has been planted in Africa very successfully and seems to have a wide climatic tolerance. Its timber production in Africa is said to be eleven times greater than that of species native to the plantation areas.

Fortunately these conifer forests of the uplands of Guatemala contain a rare and attractive bird, the Quetzal (*Pharomachrus mocinno*) which is the surest ticket any habitat can have for a rescue conservation effort of international proportions. The efforts in particular of the International Union for Conservation of Nature and the World Wildlife Fund led to the establishment in 1973 of a reserve of more than 400 ha of high altitude forest on the slopes of Volcano Atitlan in south-western Guatemala (La Basille, *Biol. Conserv.* **5**, 60; 1973). According to Veblen, there is one other area where the Guatemalan forests seem to be fairly secure—the Department of Totonicapan, where the local Indian population has long exploited the forest in a balanced manner. To them the forest represents a source of income and it is therefore jealously guarded. It is a sad reflection on modern society that the future of such potentially useful plant communities, with some claim to antiquity, now hangs in the balance. □

Red Sea: poles apart

from Peter J. Smith

FOUR years ago, Girdler and Darracott (*Comments Earth Sci. Geophys.*, **2**, 131; 1972) drew attention very briefly to the possibility that the Red Sea may have evolved in at least two separate stages of seafloor spreading. In addition, they raised, but made no attempt to answer, the question of whether or not the two phases of plate movement involved could be described by the same pole of rotation. In later presenting the evidence for a two-stage development of the Red Sea, Girdler and Styles (*Nature*, **247**, 7; 1974) made no reference to the secondary question of rotation poles, contenting themselves with describing the nature and dating of the Red Sea's geological history. But the omission did not go unnoticed; and Richardson and Harrison (*Earth Planet. Sci. Lett.*, **30**, 135; 1976) have now rectified it with a conclusion not without geological implications.

According to Girdler and Styles, a depression may have existed in the Red Sea area as early as the Carboniferous and major rifting probably began during the lower to middle Eocene. The first phase of seafloor spreading then took place between 41 and 34 Myr ago, forming what is now the wider (southern) Red Sea (that is excluding the axial trough). The evidence for this spreading came chiefly from recognisable magnetic anomalies outside the axial trough and the timing was derived from best-matching the anomalies against different portions of the reversal time scale for different spread-

A hundred years ago

M. W. DEFONVIELLE has had a spectroscope constructed with a graduated screen permitting the quantity of light admitted to be diminished in a known ratio. The moving force being regulated at will, the radiometer can be put in a state of rotation under the rays of the most scorching sun and record taken of the motion very easily. With such an apparatus it was shown by comparison with a standard oil-lamp burning forty-two grammes an hour, that on June 9, at 4 o'clock precisely, the radiating force of the sun was equal to fourteen lamps at a distance of twenty-five centimetres from the axis of the radiometer. The apparatus is tried daily at La Villette gas-works, and results of the comparisons will be tabulated and discussed.

From *Nature*, **14**, 181, June 22, 1876.