

PERTEMUAN PERSATUAN
(MEETINGS OF THE SOCIETY)

TECHNICAL TALK

P.C. ALLEN: The Wealden Facies of Northwest Europe.

Prof. P.C. Allen, Professor of Geology, University of Reading, England, gave the above talk at the Dept. of Geology, University of
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Malaya, on 23 February 1983. It was attended by a crowd of 50. Prof. Allen is completing his term as External Examiner for Geology, University of Malaya.

The Lower Cretaceous Wealden rocks have been studied by Professor Allen for many years. For the past 150 years the rocks were believed to be deltaic-lacustrine but recent studies support an onshore alluvial environment of deposition. Recent petroleum exploration of the Wealden rocks have contributed new data as well as opportunities to test earlier interpretations.

The Wealden rocks outcrop over an area in Southern England, south of London as an anticline with the older Hasting Beds Group forming the core and surrounded by the younger Weald Clay Group. The Hasting rocks are represented by more sand than clay but the Weald is more clay and less sand. From fossil evidence it has been interpreted that the sand is nearly fresh water and the clay has been deposited with variable salinity from fresh to brackish water but never marine. This is also supported by carbon isotope data.

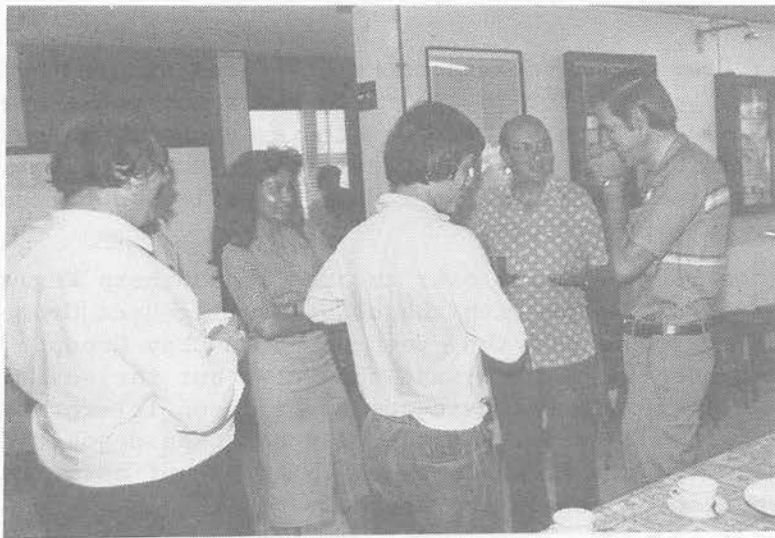
Details from two units, the older Lower Tunbridge Wells Sand and the overlying younger Grinstead Clay were given to support the new interpretation. The base of this sequence is represented by a black shale with much plant fossils which have not been seen in the past, maybe because their presence is not expected in the delta model. The black shale is succeeded by a mottled clay which is interpreted to be deep soil which has undergone fluctuating water table. Vague mottling in the rocks have now been shown to be remains of plants. The clays become more silty going up the sequence. Higher up coarser sandstone is met and the base of this layer is not parallel to the stratification but cross-cuts the stratification below at low angles. This is interpreted to be large apron sheets with an erosive base. Presence of very flat channels is evident and channels with depositional dips of 20 - 30° occur. Other features found include scour structures and 'scoops' with ripple marks going downslope, enormous flutes measuring 0.5 km across and small slumped sand bodies with onion structures. The features seen can also be seen at present in Australia, Canada and the Niger river in Mali. The delta model is not supported.

Coarsening of sand bodies up sequence is interpreted to be due to uplift of the source area believed to a massif in the London area. Uplift is caused by upward movements of a marginal fault between the massif and the depositional basin.

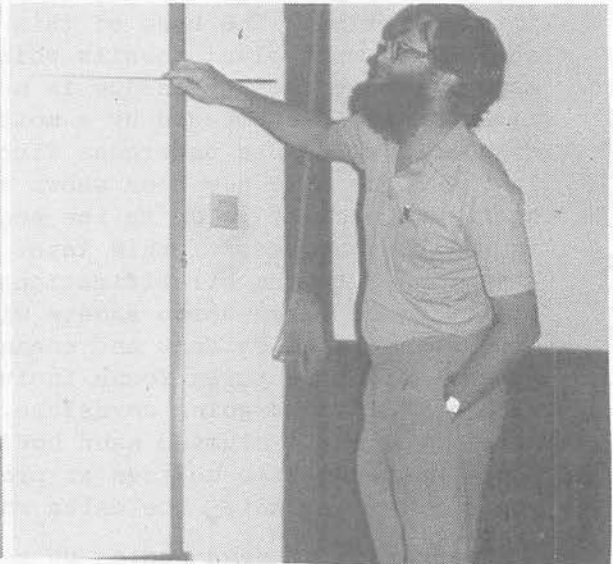
At the basal part of the succeeding clay unit new plant growths are common. The plants were *Equisetites* which were sensitive to water depth. *In situ Equisetites* with underground rhizome and a stub of perished stem above the former mud surface has been found. The plants probably perished in autumn but the rhizome propagated new growth in the following year and the sediments in which the plants have been found show seasonal varves. The top of the clay unit is red mottled clay. Siderite nodules occur in the clay. The predominance of clay over sand in this unit is related to the sinking of the London land-mass.

The whole Wealden basin has been subdivided into various sectors and detailed studies made on the mineralogical and lithological contents. High manganese garnets characteristic of Pre-Cambrian schists of Europe and Wales were found. In the sandstone unoxidized glauconite occurs and it is interpreted that the glauconite must have been rapidly

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buried. Carboniferous pebbles, Silurian graywacke, Upper Jurassic chert pebbles and others have been found. Faulting of the margin of the London landmass is suggested to have brought up the older lithologies.

In the western sector, plentiful feldspars, zircon, biotite and tourmaline have been found and sources from Cornwall and Brittany, France are likely. Using the laser microprobe the biotite has been dated to be Permian and tourmaline returns ages of Carboniferous-Permian and also Ordovician/late Pre-Cambrian. This accords well with the geology of the suggested source areas.

In the southern sector, staurolite, kyanite, sillimanite and zircon have been found suggesting a high grade metamorphic source area to the south in Brittany. Zircon has been dated to be Pre-Cambrian. Among the ages obtained there appears to be a lack of ages around 350 m.y. and this happily coincides with the Brittany 'lull'.

The 'Wealden facies' appears to be present in Malaysia as some features of the Tekai and Gagau Group bear resemblance.

T.T. Khoo