# CORRESPONDENCE

*From P. G. Fookes,*
*Imperial College, London*

LONDON BASIN GEOLOGICAL STRUCTURE

Increasing awareness and interest is being shown in the engineering significance of small scale or 'minor' geological structures found in the London Clay; for example, Ward *et al.* (1959), Ward *et al.* (1965) or Whitaker and Cooke (1966). Minor structures include small joints, very small faults and fissures. At a recent Informal Meeting of the British Geotechnical Society introduced by Mr F. G. Butler, this interest was concentrated on one of the most significant aspects of these structures, the 'fissures' of stiff fissured clay.

It is regrettable that, in general, geologists have not shown a great deal of interest in the geological structures of the London Clay, for in any fundamental work on the character, extent or significance of fissures the geological situation must be clearly understood. It may be of interest, therefore, to summarize the extent of geological knowledge on the larger scale structure of the London Basin. Work, initiated by Professor A. W. Skempton, on the small scale structures, is at present in progress, but it is premature at the moment to report on this. Wooldridge (1923) is responsible for the first clear appraisal of the tectonic problem and the following outline is largely based on his work. The lack of published geological work is

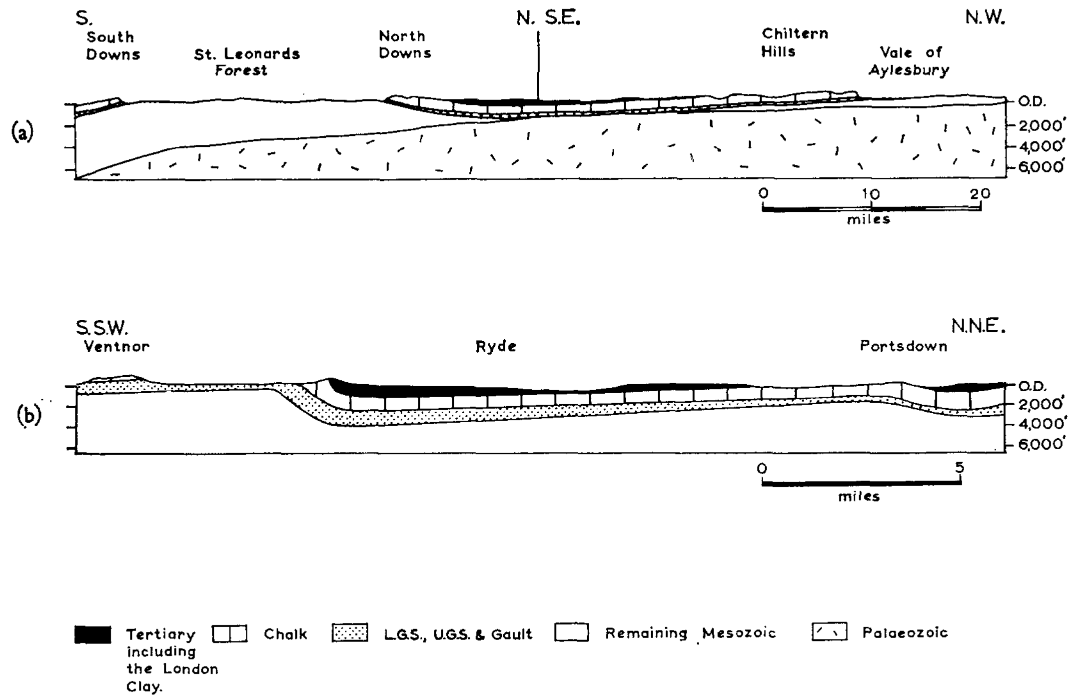


**Fig. 1. (a) Section across the Weald and the London Basin (after S. W. Wooldridge), (b) section across the Isle of Wight and the Hampshire Basin (after G. M. Davies)**

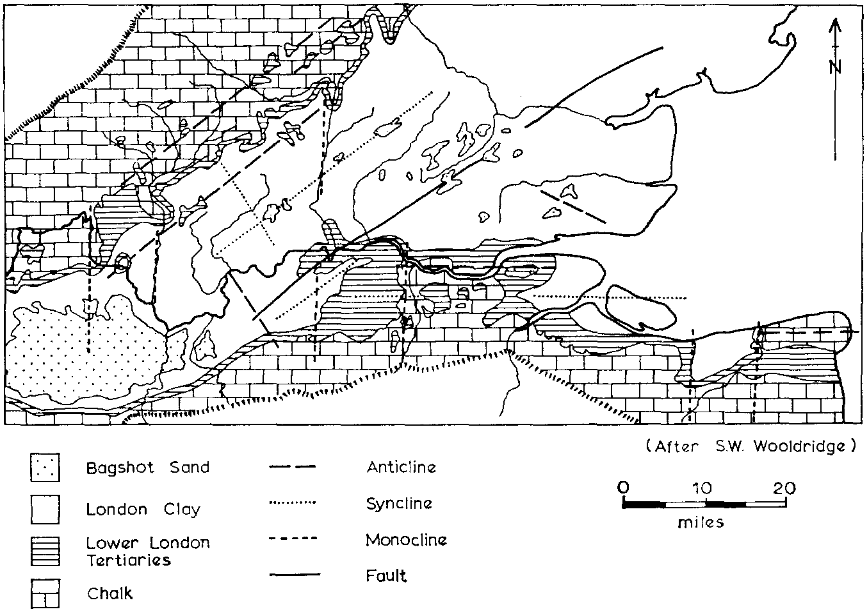


**Fig. 2. Geological structures in the London Basin**

perhaps due to the apparent simplicity of the tectonic situation which has not stimulated interest, and to the difficulty of finding the stratigraphical position of exposures and of correlation with other exposures owing to the absence of vigorous palaeontological dating. This latter is being remedied by studies of the micro fossils in the London Clay.

Fig. 1(a) shows, on a small scale, a geological section from north of London across to the south coast. The synclinal nature of the London Basin stands in contrast to the anticlinal nature of the Weald (beware of the vertical exaggeration of the scale). The overall simplicity of the structure is clearly shown together with the underlying platform of hard Devonian and older rocks. This platform or massif, is important in partly controlling, even today, the tectonic features of the London Basin. Fig. 1(b) shows a north/south section across the other area in Britain where London Clay is exposed, the Hampshire Basin and Isle of Wight. From the section it is clear that the folding is more severe than in the London area, for example, in the centre of the Isle of Wight, there is a monoclinal fold in which the London Clay beds are vertical. Dips in the London Basin itself are usually not steeper than 30° to the horizontal.

Fig. 2 shows in plan, the axes of the larger fold and fault structures in the London area. Three principal trends are apparent:

(*a*) north/south monoclines;
(*b*) east/west folds (anticlines and synclines);
(*c*) north-east/south-west folds and faults.

Wooldridge has attributed these to existing structural lines in the underlying hard rock platform; to movement during the time the London Clay was being deposited and to subsequent movements mainly related to compressive forces emanating from the growing Alpine mountains in southern Europe. The strong east/west folding of the Hampshire Basin and the generally east/west lines in the Wealden and London areas are a product of this growth. Folding occurred principally in Oligo–Miocene (mid-Tertiary) time and is responsible for the absence of deposits of this age, which could now be covering the London Clay.

The local geological structure of construction sites in the London area is usually difficult to determine because of lack of bedding evidence; indeed the London Clay is frequently portrayed in the geotechnical literature only as featureless and blue/grey/black. Ward *et al.* (1959) interpreted in plan and section a small fold in Central London, but this paper is almost unique in giving background information on tectonic(?) structure. More such information from sites would be helpful.

Imperial College of Science & Technology,
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*From Dr Ing. E. Nonveiller,*
*University of Zagreb*

## MECHANICS OF LANDSLIDES WITH NON-CIRCULAR SURFACES WITH SPECIAL REFERENCE TO THE VAIONT SLIDE

(MENCL, V., *Géotechnique*, 16:329–337)

Professor Mencl's paper in the December issue studies the stability of rock slopes in jointed rock considering the implications of stiffness and distortion of the sliding body. It should be noted that this is the first publication in which the stability of the Vaiont slide was treated as a phenomenon of rupture. In other publications on the Vaiont slide only the geologic and tectonic aspects of the problem were elaborated (Kiersch, 1964; Müller, 1964; Selli *et al.*, 1964), although in any case of rupture the final cause of failure is the lack of equilibrium between active and resisting forces.

Professor Mencl endeavours to interpret the collapse of the Vaiont slope by internal arching, formation of a gap and subsequent increase of water pressure in that gap. He obtains the angle of shearing resistance of $\phi = 18°$ for equilibrium of a profile of the slope with the actual failure surface.

The Writer had the opportunity to study the Vaiont slide in some detail. Stability analyses of the slope were carried out based on the actual failure surfaces, as detected by exploration drill holes after the slide, and with the registered piezometric levels. These analyses have shown that the average shearing resistance was not more than $\phi = 17°$ for the section studied by Professor Mencl (in western part of slide; in the eastern part, $\phi = 30°$ was obtained for equilibrium). This is well in agreement with his result, and it can be inferred that consideration of arching and Prandtl's wedges is not necessary to explain the rupture.

The formation of a gap of substantial dimensions on the slip surface, as supposed by Mencl, can hardly be expected in the kind of jointed rock of the Vaiont slope shown in Fig. 1.

Seismic shocks were registered at the dam station during the period of three years of slow sliding motion, coming mostly from a zone of the eastern part of the slide. These shocks show a peculiar incidence with the periods of acceleration of the sliding motion. It can be