Namurian strata near Cannington Park, Somerset

SIR – Investigations into the stratigraphy, structure and geophysics of the Bristol Channel area over the last few years have revived interest in the possibility that a major thrust structure, the Exmoor-Cannington Thrust, may underlie parts of North Devon and West Somerset. Some workers (Falcon 1952; Bott, Day & Masson Smith, 1958; Brooks & Thompson, 1973) have interpreted the geophysical data in terms of major thrusting, while others (Donovan, 1971; Matthews, 1974) have cast doubt upon the thrust hypothesis and suggested that major facies or thickness changes in rock units could account for the observed gravity anomalies. A critical factor in these discussions has been the structural relationships between the various Palaeozoic inliers which occur between the Quantock Hills and Bridgwater, Somerset. In the past, much attention has been focused on the Cannington Park inlier (ST 245 405), a mass of northward-dipping, oolitic, Viséan Carboniferous Limestone of S1 age (Wallis, 1924), which is disturbed and shows large shear plane surfaces. Less than 200 m to the South is the elongate, narrow, WSW-trending Rodway inlier (ST 244 398), composed, at the surface, of purple, maroon and red siltstones and sandstones (the Rodway Beds), until now presumed to be of Devonian age (Webby, 1965). Rodway Beds also occur at the Swang Farm inlier (ST 231 392) and are separated by a distance of only 300 m from the Ilfracombe Beds (Middle-Upper Devonian) of the Halseycross Farm inlier (ST 216 387) to the South. All the inliers of this area are surrounded by New Red Sandstone deposits which mask geological contacts between Palaeozoic rocks.

Following the official geological survey of the Cannington Park area by the writer, two cored boreholes were recently sunk on the Rodway inlier by the Institute of Geological Sciences drilling rig. The Withiel Farm No. 1, Cannington Park, borehole was situated at National Grid Reference ST 2435 3981, surface level about 58 m O.D.; the Withiel Farm No. 2, Cannington Park, borehole was at ST 2452 3993, surface level about 55 m O.D. The No. 1 borehole commenced in Rodway Beds and entered Carboniferous Limestone at 138.20 m to the final depth of 157.68 m. The No. 2 borehole proved 'Keuper' sandstones to a depth of 3.45 m, Rodway Beds to 40.80 m and Carboniferous Limestone to 50.85 m. The Rodway Beds are dark grey, micaceous siltstones with some thin grey sandstone bands; they were purple and green stained in their highest parts to the depths of 18.57 m and 11.12 m respectively in boreholes 1 and 2. The siltstones were badly disturbed and in places intensely fractured by fairly steeply inclined faults, commonly associated with slickensides, shiny surfaces and minor veining. At several levels in the boreholes, recumbently folded, faintly striped measures were common. At depth, close to the junction with the underlying limestone in both boreholes, the Rodway Beds were red-stained and displayed a small-scale rhythmic sequence of sandstone, siltstone and black shale. At 132.54 m depth, in No. 1 borehole, a red-stained, ferruginous, silty sandstone yielded goniatites, identified by Dr W. H. C. Ramsbottom as *Gastrioceras crencellatum*. The horizon is that of the *G. cancellatum* Marine Band (Ramsbottom & Calver, 1962) which indicates that the Rodway Beds are of a high Namurian (Carboniferous) age. The Carboniferous Limestone of both boreholes is a medium to pale grey oolitic and massive rock, which in its highest parts contains slivers and patches of green shale. In addition, the No. 1 borehole contained pink-stained limestone conglomerate or breccia. Fossiliferous limestone yielded corals, identified by Mr M. Mitchell as *Palaeosmilia*? at 144.52 m depth and *Lithostrotion martini* (in a pebble) at 144.78 m depth; the corals are consistent with the known fauna of the Cannington Park Carboniferous Limestone in nearby quarries to the N. The limestone in the lower parts of both boreholes consisted of a pale grey recrystallized rock, which is almost porcellanous or marble-like in places, but in which traces of ooliths are visible.

In both boreholes the contact between Rodway Beds and Cannington limestone was a normal fault. Separating the Rodway Beds from limestone in No. 1 bore was a 0.55 m calcite vein, which was steeply inclined near the lowest part of the Rodway Beds but inclined at 42° and associated with strong slickensiding at its junction (at 138.20 m depth) with limestone. In No. 2 bore, at a depth of 40.80 m, the lowest part of the Rodway

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Beds was in contact with limestone along a 10°-dipping surface which had up to 12 mm of vein calcite and traces of green shale along it; the surface was faintly slickensided. The absence of eroded surfaces and pebble beds and the presence of red-staining close to the siltstone-limestone interface in both boreholes also suggest that the junction is a tectonic one. In the Rodway Beds of both boreholes, close to the contact, are many small scale normal dislocations.

The simplest explanation for the tectonic juxtaposition of high-Namurian Rodway Beds and Viséan Carboniferous Limestone would be one invoking moderately high angle normal faulting with downthrow to the S. However, the low-angle surface proved in No. 2 bore may be a lag fault, which subsequently was affected by high-angle normal faulting. Lag faults are commonly developed in regions which have been subjected to strongly compressive forces; they are known in South Wales (Trotter, 1947) and are an important feature associated with thrust structures in the Mendip area (Green & Welch, 1965). The presence of a large-scale lag fault near Cannington Park could imply that there is a major thrust structure below and forward (i.e. northward) of the limestone mass, and this thrust would incrop against the Mesozoic rocks to the North of Cannington Park.

By analogy with the Rodway inlier, the rocks forming the Swang Farm inlier are probably also of Namurian age, and thus another major fracture, downthrowing possibly several thousands of metres, may be present between the Swang Farm inlier and the Halseycross Farm inlier (Middle-Upper Devonian). The sub-Mesozoic trace of this fault presumably trends roughly E–W and WNW–ESE, between the inliers, and yet must swing NW before reaching the Quantock Hills. This could be a normal fault, but in a regional geological context of strongly compressive structures, and having a curved trace, it is possible also that the fault may be the near-surface trace of the Exmoor Cannington Thrust.

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