(iii) Joints and faults affecting the Permo-Triassic rocks are of similar orientation and are possibly cogenetic. It is probable that they post-date the known Jurassic since the major movement on faults in this quadrangle and in the one to the south (Longman, 1966) was post-dolerite intrusion and pre-Tertiary sedimentation.

(iv) The joint and fault sets of (iii) correspond to the vertical joint sets in the granodiorite. Of these trends the predominating ones approximate parallelism with the dip and strike of the Permian strata and the planar anisotropy of the Mathinna Beds cleavage.

(v) Tertiary basalt extrusions were probably related to activity on north-north-westward trending fault-lines.

It is apparent that, as found by Williams (1967), the post-triassic and most probably post-Jurassic joint pattern approximates that of the late Devonian granodiorite, both in turn being similar to the fault pattern in the Permo-Triassic and Jurassic rocks. Since these relationships are unlikely to be fortuitous it is proposed that :—

(i) They were the product of probably post-Jurassic stress fields. The work cited by Williams (1967, p. 251) would appear to negate this at Dalrymple Hill, whilst joint-bounded granodiorite blocks in basal Permian conglomerate (Marshall, in press) is opposed to this possibility in the Pipers River Quadrangle.

(ii) They reflect re-activation of stress fields and/or over-riding controls of the planes of failure that might tolerate a variation of perhaps 20 or 30 degrees in the orientation of the principal stress axes. This is in keeping with the tectonic history of the period, and the outbreak of Tertiary vulcanicity suggests a re-activated stress field.

This second proposal is favoured as an explanation of relationships in the Pipers River Quadrangle. It is tentatively suggested that such early formed features as the planar anisotropy of the steeply dipping cleavage in the Mathinna rocks could have been one of the controls envisaged.

REFERENCES

LONGMAN, M. J. 1966. Explanatory Report 1-mile Geol. Map ser., K/55-7-39, Launceston. *Geol. Surv. Tasm.*

MCDOUGALL, I. & LEGGO, P. J. 1965. Isotopic age determinations on granitic rocks from Tasmania. *J. geol. Soc. Aust.*, **12**, 295–332.

MARSHALL, B., BARTON, C. M., JENNINGS. D. J. & NAQVI, I. H. 1965. Pipers River Sheet. *Geol. Surv. Tasm.*, 1-mile Geol. Map Ser. 8315N (K55-7-31).

MARSHALL, B. In press. Explanatory Report 1-mile Geol. Map Ser. K55-7-31., Pipers River. *Geol. Surv. Tasm.*

WILLIAMS, E. 1967. Joint Patterns at Dalrymple Hill, North-east Tasmania. *Geol. Mag.*, **104**, 240–252.

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THE SILURIAN–DEVONIAN BOUNDARY

Sir,—In 1965, Holland presented a very comprehensive account of the problems relating to the Siluro–Devonian Boundary. He made a case for the retention of the stable and clearly defined boundary marked by the base of the Ludlow Bone Bed (as defined by White (1950) and Holland, Lawson & Walmsley (1963)). His appreciation that many workers on the continent were at that time anxious to establish a boundary at a very much higher position in the Central European graptolitic successions probably prompted him to suggest a compromise boundary at the base of the *M. uniformis* Zone.

It appears that many of our continental friends, anxious to contain as much as possible of their graptolite-bearing Devonian succession within the " Ludlovian ", have readily agreed to Professor Holland's alternative suggestion (Bouček, Horný & Chlupáč, 1966).

Selection of the base of the *uniformis* Zone as a new Siluro–Devonian boundary leaves much to be desired. Although the variations in conodonts, vertebrates and other fossil forms are being examined, the graptolites appear to provide the main support for the choice. The long-supported idea that graptolite species were relatively free from environmental influence and were, therefore, infallibly isochronous at their onset, cannot be accepted. The very absence of graptolites from the Lower Devonian marine deposits of Britain and the Rhineland indicates the existence of this influence. Biostratigraphic divisions based on quite different faunas or floras may yet provide us with more nearly equatable " time-boundaries ".

The *uniformis* boundary would create numerous stratigraphic difficulties in this and other countries. In Britain, " Old Red Sandstone " and " Devonian " would lose their synonomity, and the Siluro–Devonian boundary would fall in the middle of a monotonous and virtually unfossiliferous strongly terrestrial succession, and would probably never be accurately distinguished. Suggestions that rocks above the Ludlow Bone Bed should be annotated " Ludlovian " are most confusing. The limits of the Ludlovian rocks in Britain are clearly defined. If the *uniformis* boundary is chosen, the Downtonian Stage most closely correlates with the interval between the Ludlow and the base of the *uniformis* Zone (Holland, 1965b).

From my own researches it seems evident that the invertebrate faunas of the Calcaire de Liévin, or the upper part of the Skala Formation as described by Kozlowski (1929), are somewhat younger than those of the Lower Downtonian marine faunas in South Wales.

The Ludlow Bone Bed cannot be correlated with many of Europe's described successions because in a large proportion of these only Devonian rocks are evident. To adjust the position of the boundary solely to provide a division in these successions seems unwarranted. Where Ludlovian rocks are present, as in the Baltic area, we are able to establish acceptable correlations within the European succession without the need for a new boundary. It would seem preferable to wait until a section is finally described in which the choice of an arbitrary datum horizon meets more widespread international agreement.

REFERENCES

Bouček, B., Horný, R. & Chlupáč, I. 1966. " Silurian versus Devonian ". *Acta Musei Nat. Prague.* **22B,** No. 2.

Holland, C. H. 1965a. The Siluro–Devonian Boundary. *Geol. Mag.*, **102,** 213–221.

—— 1965b. Siluro-Devonian Boundary. *Geol. Mag.*, **102,** 463–4.

—— Lawson, J. D. & Walmsley, V. G. 1963. The Silurian Rocks of the Ludlow District, Shropshire. *Bull. Brit. Mus. (Nat. Hist.) Geol.*, **8,** 95–171.

Kozlowski, R. 1929. Les brachiopods gotlandiens de la Podolie Polonaise. *Palaeont. polon.*, **1,** 1–254.

White, E. I. 1950. The vertebrate faunas of the Lower Old Red Sandstone of the Welsh Borders. *Bull. Brit. Mus. (Nat. Hist.) Geol.*, **1,** 51–67.

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PRELIMINARY RESULTS OF A BOREHOLE AT PETROCKSTOW, NORTH DEVON

Sir,—As part of the geological mapping of the Chulmleigh (309) Sheet, a borehole was drilled for the Institute of Geological Sciences ten miles north-north-west of Okehampton, Devon, at Tileyard Farm, Petrockstow [SS 5201 1041], elevation 197 feet A.O.D., to investigate the thickness and lithologies present in a deposit of presumed