

SIR,—I am glad that Mr. Theokritoff agrees with me that there are important differences between the Salrock Fault and the Southern Upland Fault, though in his paper (1951, p. 47) he merely states that the former "is an overthrust from the north; it is thus not comparable with the Southern Upland Fault". There are more important distinctions than this (McKerrow, 1959).

The Salrock Fault is clearly post-Silurian, and I fail to see why Mr. Theokritoff should point out with such emphasis (both in his 1951 paper and in his letter) that he thinks it separates different Lower Ordovician facies. If he had closely investigated the area around Bunnacunneen, he would have found that all the west of Ireland Lower Ordovician facies are present to the east and south of the Salrock Fault. With Dr. C. J. Campbell (1960), I have found that the (probably Llanvirn) Glenummera Slate outcrops on the western and north-eastern slopes of this hill (i.e. to the east of the dextral NW-SE fault between Rinavore and Bunnacunneen mentioned in the above letter). It follows that the grits below the slate are Lower Ordovician. These grits continue, with only slight breaks due to faulting, to the north of the spillites at Curraghrevagh, so that the area immediately south of Lough Nafoeey is entirely Lower Ordovician. Mr. Theokritoff is thus wrong in following the conclusions of Gardiner and Reynolds (1914), who, because they also did not map Bunnacunneen, thought that the grits present south of the lough were the Upper Ordovician Mweelrea Grits.

North-east of Bunnacunneen, the Salrock Fault separates the Lower and Upper Ordovician grits; its throw is unknown. This need not be great, as the Glenummera Slate is seen to thin out and disappear; the presence of slate fragments in the base of the overlying Mweelrea Grits shows that this disappearance is at least partly due to erosion. The thinning of the Lower Ordovician grits does not affect any conclusions as to the throw—they occur on both sides of the fault.

The continuation of the Salrock Fault may be traced along the ridge to the north-west of Curraghrevagh Stream before being lost below the alluvium south-west of Lough Nafoeey. There is no evidence that the fault suddenly swings to the east to pass south of the Lough. It is last seen, at Curraghrevagh, trending north-east, and it would seem reasonable to expect any continuation to lie in that direction.

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CENOMANIAN AMMONITE ZONES

SIR,—There is a curious anomaly in the present scheme of subdivision of the Cenomanian into ammonite zones, viz:—

Upper Cenomanian .	{	<i>Utaturiceras vicinale</i>
	{	<i>Acanthoceras rhotomagense</i>
Lower Cenomanian .	{	<i>Mantelliceras mantelli</i>
	{	<i>Mantelliceras martimpreyi</i>

Since 1926, when Spath introduced the Indian "*Acanthoceras*" *vicinale* (Stoliczka) as an index-fossil for the topmost beds of the British Cenomanian,

a *vicinale* Zone has been quoted as part of the standard Cretaceous succession; it has been written into the world's text-books and has taken its place alongside the classic ammonite zones of the European Mesozoic.

Study of British material and the literature has failed to satisfy me that a single specimen of the *vicinale* group has ever been found in the Upper Cenomanian, in Europe or elsewhere. On the contrary, where the *vicinale* Zone appears to be most firmly established, i.e. in Madagascar, a check of original published records shows that what little evidence of horizon there is indicates a low Cenomanian level for the *vicinale* group.

The idea that "A." *vicinale* occupies a position near the boundary of the Cenomanian and the Turonian seems to have originated with Kossmat (1895, p. 200; 1897, pp. 25, 131), who inferred its horizon from the matrix. Kossmat was also struck by the resemblance of the ammonite to the Lower Turonian "*Ac.*" *swallovi* (Shumard)—i.e. *Metoicoceras*.

Ammonites vicinalis is also important as the type species of the genus *Utaturiceras* Wright, which is regarded as the earliest member of the *Metoicoceratinae* and a link between the *Acanthoceratinae* and the Turonian *Metoicoceras* (Wright, 1956; 1957, p. L 416). Compared with *Metoicoceras*, the special features of *Utaturiceras* are said to be a row of siphonal tubercles which may weaken on the outer whorl and a more complex suture.

Stoliczka (1864, p. 84, p. xlv) gave a very full description of *A. vicinalis* and devoted a whole folio plate to illustrations of the ammonite in different stages of growth. Neither in this account nor that of later authors is there mention or depiction of siphonal tubercles at any size. In some of Stoliczka's figures (6a, 8a) the whorl-profile is gently convex between the ventro-lateral tubercles, a feature commonly seen in *Mantelliceras*.

In whorl-shape, coiling, sculpture, and suture-line *A. vicinalis* can be matched with basal Cenomanian *Mantelliceras* of the type of *M. saxbii* (Sharpe), which Spath (1926, p. 424) styled "a closely allied British equivalent" of *M. martimpreyi*. So close is the agreement between some Chloritic Marl specimens from southern England and Stoliczka's figures that specific separation is difficult. Stoliczka himself thought that *A. vicinalis* and *A. saxbii* might be synonyms.

The relationship of *A. vicinalis* with these early, compressed forms of *Mantelliceras* was seen by Pervinquier (1907, p. 288); if we wish to separate them from the inflated *mantelli* type, with an extra lateral tubercle, the name *Submantelliceras* Spath, 1923, may be used in a subgeneric sense.

Ammonites resembling immature *A. vicinalis* in side view, though with a reduced suture and a row of siphonal tubercles in the young, are found in the topmost Cenomanian (Jukes-Browne's Bed C) of Devon (e.g. Geological Survey Museum No. 98364). They appear to be congeneric with those described by Stephenson (1955, pl. 5, figs. 1–10) from the Upper Cenomanian of Texas as *Tarrantoceras rotatile*. Other forms which occur in the same bed and which have been mistakenly included in "*Utaturiceras*" belong to an undescribed group allied to *Protacanthoceras* and *Dunveganoceras* (e.g. British Museum, Natural History, Nos. C 56619–20). Whereas *Mantelliceras* ("*Utaturiceras*") of the *vicinale-saxbii* group have sutures with the backward-slanting series of auxiliaries found in the ancestral *Stoliczkaia*, these Devon forms have more linear suture-lines, with very small second lateral lobe and plumper elements. It is uncertain that they are connected directly with either *Mantelliceras* or *Metoicoceras*.

These observations indicate that *M. vicinale* cannot be used as a guide fossil for the topmost zone of the Cenomanian, and that in fact any zone based on *vicinale* is the same as the *martimpreyi* Zone at the base of the Stage. It may be suggested that "*Utaturiceras*" is a fallacious concept combining characters of *M. vicinale* and other, unrelated, acanthoceratid ammonites; as defined by its type species it is a subjective synonym of *Mantelliceras* Hyatt, 1903, and *Submantelliceras* Spath, 1923. Some change in zonal nomenclature is required to accommodate the topmost beds of the British Cenomanian, characterized by species of *Protacanthoceras*, *Euomphaloceras*, *Calycoceras*, and *Eucalycoceras*.

Fuller details of this research and pictures of the relevant ammonites will be published in due course. The essential information is contained in the following bibliographical references.

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LONDON, S.W. 7.
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DEVONIAN-CARBONIFEROUS BOUNDARY

SIR,—I wonder why the explanation of the relations between the Carboniferous and Devonian rocks of S.W. England and S.W. Ireland did not occur to workers on these problems many years ago.

Anyone looking at the fossils in the Barnstaple Museum must recognize at once that the Pilton Beds are in part of Upper Devonian Age. Also, it is obvious, as Vaughan claimed, that some part of the Pilton Beds may extend into the lower part of the Carboniferous, possibly into the *Zaphrentis* zone. Thus the Pilton Beds form an apparently continuous passage between the Upper Devonian and the lower part of the Carboniferous.

In the Pembroke and Tenby Memoir, E. E. L. Dixon showed that such a passage occurred in S.W. Pembrokeshire and it was impossible to suggest where a boundary could be drawn between the two formations. These results confirm the remarkably acute observations of Salter who showed that in Pembrokeshire the Upper Old Red Sandstone developed into a marine facies which could be closely compared with the Pilton, Baggy, and Marwood Beds of North Devon.

A little earlier than the Pembroke and Tenby Memoir, another Geological Survey Memoir—Haverfordwest—had appeared. In that memoir the gradual encroachment of the base of the Millstone Grit on the Carboniferous Limestone (Viséan) development was described until in the neighbourhood of Haverfordwest, *Reticuloceras*-bearing shales rested unconformably on S₁ of the Viséan and a few miles further west the Millstone Grit had overstepped the whole of the Viséan.

You have only to combine these two relationships as developed in S.W. Pembrokeshire to arrive at the solution of the so-called Carboniferous Shale problem which was raised by Jukes in Ireland. In S.W. Ireland fossiliferous marine Upper Devonian in a slaty development apparently passes up conformably into Coal Measure slates without the intervention of the Carboniferous Limestone so typically developed further east around Cork.

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8th February, 1960.

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