CORRESPONDENCE

The location of the Iapetus Suture in the Scandinavian Caledonides

SIR,—The idea that the Caledonian orogenic tract of NW Europe includes the site of an ancient ocean, which existed in late Precambrian and early Palaeozoic times, has received wide acceptance. The location of the suture or scar marking the site of the ocean in Britain has been the topic of much discussion (e.g. Dewey, 1969; Wilkinson & Cann, 1973) and there has been some discussion of the suture in Scandinavia north of the Arctic Circle (Nicholson, 1971; Harland & Gayer, 1972), but so far little discussion of the portion of the Caledonides in SW Norway. I believe that it is possible to make some observations about the location of the suture in the Scandinavian Caledonides on the basis of published work, particularly the detailed information about Norwegian geology given by Strand in *The Scandinavian Caledonides* (1972), of which he is co-author with Kulling. I shall refer to the suture as the 'Iapetus Suture', following the nomenclature of Harland & Gayer (1972, 1973).

Strand does not fit his regional descriptions of structure into a tectonic scheme describing the Scandinavian Caledonides as a whole. However, Kulling does outline such a scheme, which may be correlated with the local structural sequences described by Strand and other workers in Norway (Strand & Kulling, 1972, 277–9). Figure 1 illustrates these correlations, as far north as the Arctic Circle. I have omitted the local Swedish names for the structural units, which are summarized by Kulling (Strand & Kulling, 1972, 159), but one term is useful to this discussion, the name 'Seve-Köli Nappe Complex' for the Upper Thrust rocks of Västerbotten and Norrbotten in Sweden, and Trondelag and Nordland in Norway.

Dewey (1969) has indicated a possible line of suture through the Caledonian tract of SW Norway. His proposed line runs along a belt of serpentinite bodies, apparently between Bergen and the Jotunheimen Mountains (Fig. 2). This would make the Western Gneiss region of Norway, lying NW of this line, a part of the Laurentian Precambrian shield, rather than the Baltic Precambrian shield. This interpretation is contradicted by the evidence given by Strand, who argues that the distinctive charnockites, granulites and basic igneous rocks (the 'Jotun Kindred') of the Jotun Klippe correlate with comparable rocks seen in the Bergen Arc structures (Fig. 2). This correlation was first proposed by Goldschmidt (1912) and has been accepted by workers in the area since. The roots of the Jotun Nappe must lie farther W or NW than Bergen because the Jotun Kindred rocks in the Bergen Arcs are themselves allochthonous and have been downfolded in a late Caledonian structural episode.

In the Valdres Nappe SE of the Jotunheimen Mountains, one of Lower Thrust units (Figs 1, 2), it has been shown that rocks of the Jotun Kindred lie unconformably below a continuous succession of late Precambrian sparagmitic sandstones, which are overlain by fossiliferous rocks of Ordovician age (Loeschke, 1967; Nickelsen, 1967). Nickelsen has demonstrated that the stratigraphical sequence in the Valdres Nappe is overturned, a conclusion which has been accepted by Strand, contrary to his earlier views (Strand, 1962). Similar successions of older Precambrian crystalline rocks, unconformably overlain by arkosic sandstones of sparagmite character, in turn overlain by dominantly pelitic rocks of Cambro-Silurian age, are found in the underlying Vemdal Nappe, and in the autochthon of Norway and Sweden. The fossils belong to the Baltic faunal province. It follows that the Jotun Kindred rocks are Precambrian basement of the Baltic shield, not the Laurentian shield. Therefore the Iapetus Suture cannot lie where Dewey traces it.

The Seve-Köli rocks of the Upper Nappes of Trondelag and Nordland contain Lower Palaeozoic fossils which show affinities with the American rather than the Baltic faunal province, as pointed out by Nicholson (1971). He therefore suggests that the rocks are

Geol. Mag. 111 (5), 1974, pp. 439–450. Printed in Great Britain.

Kulling's tectonic classification	*Nappe region of central Southern Norway*	*Western Norway*	*Trondheim region*	*Nordland*
Uppermost thrust rocks	—	—	—	Rodingsfjäll nappe (Beiarn nappe above Gasak nappe below)
Upper thrust rocks	—	—	Upper nappe of Trondheim area (Gjersvik nappe)	Seve–Köli nappe complex
Middle thrust rocks	Jotun nappe?	Jotun kindred rocks of Bergen Arcs	*Gneisses of Tommerås anticline and Grong culmination	*Gneisses of Nasafjell window and Tysfjord culmination
Lower thrust rocks	Valdres nappe Sparagmite nappe of Lake Mjosa region (Vemdal nappe)	1. Hardanger nappes in south 2. Bergsdalen nappes east of Bergen *3. Western gneisses in north		
Lowermost thrust rocks	No Norwegian equivalent			
Autochthon	Autochthon			

Figure 1. Tentative structural correlation of some units in the Scandinavian Caledonides, based on Strand & Kulling (1972, esp. chs. XVII and XXVII). Units marked with an asterisk (*) are usually regarded as autochthonous in Norway. Data on Trondheim region after Wolff (1967); data on Nordland partly after Nicholson & Rutland (1969).

derived from the Laurentian Craton side of Iapetus, and that the suture is represented by a nappe thrust surface somewhere below the Seve-Köli Nappe complex. In Nordland – the area with which I am acquainted – this surface is flat-lying and formed early in the deformation history, so that it is now folded and overprinted by regional metamorphism

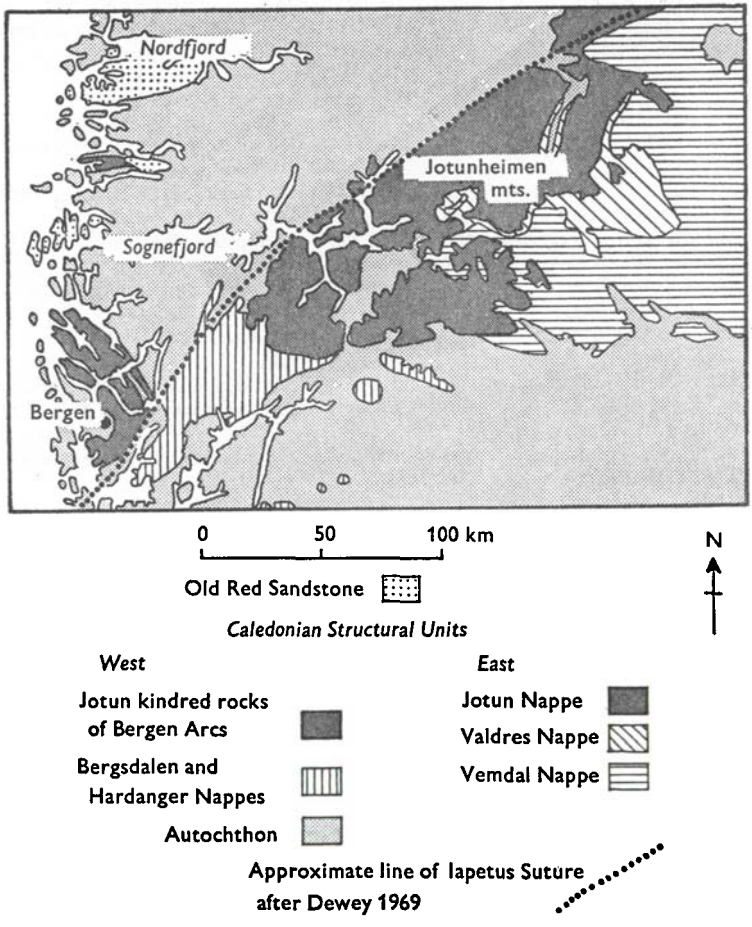

Figure 2. Geological sketch-map of Western Norway, based on Strand & Kulling (1972, Figs. 18, 22). Note how the Jotun nappe crosses the line of suture proposed by Dewey (1969), and also the position of the Valdres nappe, in which Jotun kindred rocks lie unconformably beneath sparagmitic sandstones.

and can be recognized only on the basis of faunal distinctions. The Seve-Köli Nappe Complex, particularly in the eastern part of the outcrop of the Upper Nappe rocks, contains considerable thicknesses of basic volcanic rocks of Lower Palaeozoic age, including pillow-lavas. Ultramafic rocks of various kinds occur, such as the serpentinite-rich conglomerate of the Trondheim district, and tectonic inclusions of serpentinite which occur on various scales and at various structural levels in the sequence. The sedimentary sequences are usually shallow-water in character, however, and the overall lithological

association resembles the Dalradian of Scotland rather than the ophiolite and flysch association of the Alpine–Himalayan belt, as Gayer (1973) remarks.

Thus the location of the Iapetus Suture in Scandinavia proposed by Dewey (1969) is incompatible with the geological evidence. The suture surface appears not to be the steep zone demanded by simplistic Plate Tectonic theory, but a flat-lying, tectonically complex structure whose position might well coincide with the thrust contact between the Upper Thrust rocks and the Middle Thrust rocks of Kulling's tectonic scheme.

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8th March 1974

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Silurian, Devonian and Old Red Sandstone

SIR – I am surprised to read that Dr Earp (*Geol. Mag.* **110** (3), 1973, pp. 301–2) only now wishes to cease to maintain 'the exact equivalence of the term Old Red Sandstone and the term Devonian'. The Old Red Sandstone remains a most useful term for a particular magnafacies but it has long been regarded as chronostratigraphically woolly at both ends.

Much was heard, during the long controversy over the placing of the Silurian-Devonian boundary, of the precision with which it is now possible to correlate the