rate of production of reducing equivalents from a solution of potato starch by a crude soluble 'amylase' prepared from germinated barley (N. Harris and J. S. G. R., unpublished).

Our results to date, therefore, suggest that fatty acids of chain length around $C_9$ inhibit both the production and the activity of amylolytic enzymes. Both effects undoubtedly contributed to our earlier observations[1].

Meredith's suggestion that fatty acids might interact with starch, making it less susceptible to amylolysis, adds a further variable to an already complex problem. Any observed inhibition by fatty acids of amylolytic activity could be attributed either to a fatty acid–enzyme interaction or to a fatty acid–starch interaction as proposed by Meredith. We cannot yet assess the relative importance of the two effects in our assays, and we point out that even the experimental data presented by Meredith can be reinterpreted in terms of a fatty acid–enzyme interaction.

DAVID C. BULLER
J. S. GRANT REID

*Department of Biochemistry,*
*University of Stirling,*
*Stirling, UK*

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## An imbricate thrust model for Southern Uplands of Scotland

THE timing of the letter by McKerrow, Leggett and Eales[1] is curious in that the model is not new. It was anticipated in concept by Mitchell[2] and in detailed demonstration by Fyfe and Weir[3]. In addition information given within the article includes details of the sequences seen along the British Gas pipeline, and a structural analysis from the Moffat area by Eales. The former is interesting although unexceptionable, apart from the fact that it sets aside without justification previous evidence that not all the Ordovician volcanics are of Arenig age[4–6]. The structural analysis is unsubstantiated but, more importantly, it ignores structural sequences already established from many other areas in the Southern Uplands and Ireland, which are supported by recent studies[7,8].

The history of Cockburnland also requires clarification. Originally proposed[5] as the largely ophiolitic source for the Ordovician flysch of the Southern Uplands, it has been criticised as inadequate to provide the accumulated volume of sediment[9]. The name was retained, but was used instead to designate the landmass uplifted in Llandovery times[10] south of the nascent Southern Uplands Fault, and now considered to represent the emergence of an evolving accretionary prism. Obduction of oceanic crust towards or over the Laurentian front[11] would create a sedimentary source adequate to provide the known volume of Ordovician flysch, thus dispelling the objection to an Ordovician Cockburnland. We consider that application of the name to the developing accretionary prism can be justified only by assuming geographical continuity with the remnants of the original structure.

Furthermore, the model prescribes progressive sedimentation of coarse clastics from north west to the south east. This must be an over-simplification, in that for at least part of the Llandovery the Moffat shale belt was bounded to north west and south east by thick sandy sequences[12].

E. K. WALTON
J. A. WEIR

*Geology Department,*
*University of St Andrews,*
*St Andrews, Fife, UK*

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MCKERROW, LEGGETT AND EALES REPLY,—The timing of our contribution was the result of work carried out in 1976 on new exposures in the British Gas pipeline. The model relating the structure of the Southern Uplands to contemporary subduction was first illustrated by Mitchell and McKerrow[1]; this model was based, in part, on earlier work by Craig and Walton[2], Toghill[3], Kelling[4] and Fyfe and Weir[5].

Our contribution did not imply that all the Ordovician volcanics in the Southern Uplands are of Arenig age. Those near Abington lie below Arenig cherts, while those at Coulter underlie Llandeilo cherts; the cherts in both areas may well be much younger than the basalts below them. In addition, there are other volcanics interbedded with greywackes (like those at Wrae and Bail Hill), but these are not oceanic basalts.

The structural analysis (Eales, unpublished) was applied specifically to the incompetent Moffat Shale facies where it occurs at the base of major thrust sheets. It is only in this facies, with its classical graptolite faunal successions, that refined stratigraphy can be used as a basis for structural synthesis. Other local structural sequences (for example, Rust[6]; Weir[7]) are generally consistent with this analysis, but they lack detailed stratigraphic control.

Walton[8] gave the name Cockburnland to the emergent "chain stretching north-eastwards along the northern margin of the present Southern Uplands" which provide a source for the Llandeilo and Caradoc rocks of the area around Glen App. He also used the same name for the Llandovery landmass which provided sediment both northwards (to the Silurian of the Midland Valley inliers) and southwards (to the Central and Southern Belts of the Southern Uplands). The 'Cockburnland' shown in our contribution (Fig. 3) is the second of these two land areas. It is not clear whether the earliest Ordovician greywackes were derived directly from previously obducted ophiolites lying to the north of the Southern Upland Fault (as Walton and Weir suggest), or whether they were derived from previously accreted ocean floor volcanics and cherts on the inner trench wall.

Our model implies that most of the sediments in the Southern Uplands were deposited on the floor of (or on the margin of) the Iapetus Ocean. Even though coarser sediments occur in the Llandovery and Wenlock beds exposed in the Southern Belt of the Southern Uplands, this does not imply any south-east boundary to the 'Moffat Shale belt', it merely shows that coarser sediments were being deposited on the Iapetus Ocean at this time.

W. S. MCKERROW
J. K. LEGGETT

*Department of Geology and Mineralogy,*
*Parks Road,*
*Oxford, UK*

M. H. EALES

*Department of Geology,*
*The University,*
*Glasgow, UK*

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