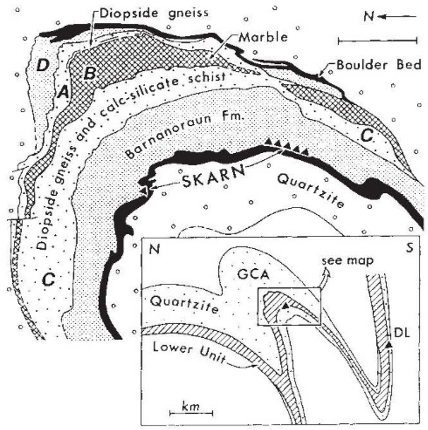

Outline gelolgical map of Glencoaghan. Inset shows a vertical, true-scale N-S cross-section through the area. Scale bars: main figure, 250 m; inset, 1 km. GCA. Glencoaghan antiform; DL, Derryclare Lough; △, skarn.

tion inside the carapace of Bennabeola quartzite which encloses the older rocks (see inset of figure). However, mineral assemblages in these rocks, including those from the D3 sillimanite grade overprint, show that little or no muscovite breakdown has occurred and (apart from destruction of staurolite) that they did not provide a major source of metamorphic fluid during D3. Also, the pelite band regarded as forming a pathway for this fluid is isolated in two-dimensional section (*D*) and could not have effectively tapped fluid from the rest of the formation as postulated. Yardley *et al.* claim that bodies of garnet skarn mark high-level, pipe-like conduits by which the metamorphic fluid left the formation and passed into the overlying rocks, but this interpretation is not borne out by their structural location. The garnet skarn at Glencoaghan is a stratiform body located in the inner arc of the antiform; the one at Derryclare Lough is on the limb of a D3 fold; and the skarn near Maam occurs in a D4 culmination but its structural position with repsect to any D3 fold is unknown.

Finally, the Glencoaghan antiform is no less tight than other D3 folds in Connemara; it has a broad rounded hinge zone at Glencoaghan because it has folded a kilometre-thick, competent band of quartzite at that locality, and there is no need to invoke local rheological changes in the Connemara Marble Formation due to sudden fluid loss to explain the fold geometry.

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YARDLEY *ET AL.* REPLY — The differences between our interpretation of regional fluid flow through the Connemara marble and Tanner's arise through differences in our maps; oversimplifications that inevitably accompany a short article; and because of differences in interpretation of the relative ages of mineral growth and deformation. Tanner and Shackleton[2] carried out the regional survey of this part of Connemara, but our large-scale mapping, on which our cross-section was based[1], allowed us to map out many units not distinguished on Tanner's sketch map, and these provide the detail behind our hypotheses.

Tanner suggests that there are fewer distinct calc-silicate units and that their variations in thickness are due to tectonism rather than primary development. We found that the metasomatic calc-silicate unit or "diopside rock" (Tanner's unit *A*) is unique and readily distinguished in the field from Tanner's unit *C*. But a persistent, near monomineralic, diopside rock can only have originated by a metasomatic event when diopside was stable. There is a thin but persistent marble below and to the west of *C*, not mapped by Tanner, and we consider this to be equivalent to his marble unit *B*, thinned on the inverted limb of the major D2 fold. Our section[1] shows the thickness variations of both the diopside rock and a green marble not distinguished on Tanner's map. It is clear that the green marble in particular simply does not occur away from the D3 fold crest, but other rocks, including very ductile marbles, show no such tendency to concentrate in the D3 hinge. This does not agree with a tectonic thickening model. The thickness of the diopside rock may vary as a result of D3 strain, but if so this strain must predate metasomatism and diopside growth, because the coarse, random texture of the rock is similar irrespective of whether the unit is attenuated (about 1 m) or thickened (3–4 m).

At a larger scale, Tanner points out that some developments of green marble and calc-silicate are apparently on D3 fold limbs. Here we defer to his more extensive mapping experience, but we make two points. First, his regional cross-section is simplified to show only those fold closures which structural geologists consider to be major ones. On the ground, D3 folding is more pervasive, as is apparent from our section. The marble quarry at Derryclare lough contains abundant small-scale D3 folds, suggesting that it lies in a D3 monoform of antiform-synform pair which may have been on a sufficient scale to be signficant for migrating fluids, if not for subsequent geologists. Second, a D2 hinge line in a D3 fold limb would equally act as a linear focus for flow.

Tanner claims that diopside was stable during the D2 deformation as well as during D3. If this were true of diopside in metasomatic rocks it could invalidate our model. But we have seen no evidence for this, and Tanner provides no details, nor indicates the assemblages in which this supposedly early diopside occurs. It is clear from the textures of pelitic schists elsewhere in Connemara[3,4] that the regional metamorphic grade during D2 was in the garnet zone, and it would be remarkable for the sort of diopside and forsterite marble assemblages observed in the Connemara marble to develop at such a low temperature.

Tanner also questions whether nearby schists could have provided enough water to cause the metasomatism that we report. He points out that muscovite does remain stable at Glencoaghan, and it is more likely that dehydration of staurolite, with muscovite and quartz, was the likely source of the abundant sillimanite. We concur, and in this case we have probably underestimated the volume of source schist required; but as sillimanite schists are common and metasomatised marbles rare in the area, this merely implies a somewhat larger fluid source region than we suggested[1]. A further point of disagreement is the extent of the schists overlying the marble sequence, and separating it from a thick mass of quartzite. This is a detail of mapping in a very poorly exposed part of the area, and we see no reason to revise our map. We reiterate that isotope evidence provides a definitive link between pelite and diopside rock.

Tanner also notes that the small, apparently strata-bound skarn occurrences at Glencoaghan underlie the calc-silicates, (although they may well be above similar rocks in deeper parts of the fold stack). However the largest skarn body, which forms the basis for our model and occurs about 16 km to the east of Glencoaghan, has clearly cross-cutting relationships to the host rocks (boulder bed) and structurally overlies the Connemara Marble Formation, which does not in fact surface where the skarn pipe outcrops[3].

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