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On 'metabasite'

SIR,—The term 'metabasite' first appeared in the writings of Sederholm (1907) when he stated: 'At the Geological Survey of Finland we have lately started to use the word metabasite as a general name for metamorphosed (amphibolitized) basic rocks (diabase, etc.). The term metabasite...has been suggested by Victor Hackman.' Here Sederholm says 'metamorphosed basic rocks', not 'basic metamorphic rocks', and referring as he does to 'diabase, etc.', leaves us in no doubt that metabasites are metamorphosed basic igneous rocks. Certainly, this was the sense in which the word was accepted. Rice's *Dictionary of Geological Terms* defines metabasite as 'A general term for metamorphosed basaltic, doleritic and allied rocks, the types included ranging from diabase and epidiorite to hornblende-schist (Holmes).' The *Glossary of Geology and Related Sciences* (Howell, 1957) gives 'Metabasite – a general term for metamorphosed basic igneous rocks (originated by Hackman, 1907).' The term was not widely used and Poldervaart's (1953) important review article on the metamorphism of basic rocks preferred 'metabasaltic' as a general term. Recently Miyashiro (1968) has revived 'metabasite', writing 'Metamorphic derivatives of basalt, dolerite, diabase and gabbro have been called metabasalt, metadolerite, metadiabase and metagabbro respectively. When recrystallization is essentially complete however, mafic metamorphic rocks lose all trace of the original mineralogy and texture; thus it becomes impossible to tell whether the rock was derived from basaltic or gabbroic rocks. All the metamorphosed mafic rocks have been collectively called metabasites by Finnish geologists. This term will be used in this paper.' Miyashiro scrupulously preserves and reaffirms the original sense. His practice is followed by many workers in this field.

In relation to Rosenbusch's two metamorphic prefixes, para- and ortho-, metabasites attract ortho- by definition and include ortho-amphibolites and pyroxene ortho-gneisses in the amphibolite and granulite facies respectively (see Leake, 1964).

Recently the new terms 'ortho-metabasite' and 'para-metabasite' have been coined to cover 'metabasic igneous dykes and meta-sedimentary (basic differentiates?) mafic bands associated with gneisses' (Misra, 1971). As extensions of metabasite, the terms are illogical; by definition metabasites are ortho- and they cannot also be para-. As qualifiers they are undesirable, for they virtually destroy the original meaning of metabasite by denying the term its igneous genetic connotation, moreover they introduce considerable imprecision in terms of both mineralogy and chemistry.

Up to now the definition of metabasite has been unequivocal. The new terms will lead to confusion and ambiguity. On grounds of precedence and usefulness the original definition is to be preferred.

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Observations on the Kaiserstuhl Loess

(Plates 1–3)

SIR,—In the recent paper by Smalley, Krinsley & Vita-Finzi (1973) it is contended that the Kaiserstuhl loess was derived from glacially-ground material. Evidence from scanning electron microscope examination of quartz particles is given to support this. While it is not disputed that such grinding can take place and that this may ultimately give rise to loessic deposits, this is certainly not the only possible origin. This is accepted by these authors, though they attribute most of the debris to glacial grinding.

I have been investigating some morainic deposits and related glaciers in Saastal, Switzerland (Kanton Wallis), for several years. This area lies to the N of the main Alpine Watershed and may have contributed material to the circum-Alpine loesses. The study includes scanning electron microscopic examination of quartz grains from various environments. I would like to make two points regarding the origin of (European) loess deposits and the interpretation given by Smalley, Krinsley & Vita-Finzi.

(1) Most of the morainic material in the Alps consists of material which has been extra-glacially derived; that is, it has fallen from the cliffs and mountain sides or been swept there by various processes, transported on a glacier surface and then dumped as a moraine ridge or a thin veneer on valley floors. In a sense, therefore, this material is 'glacial' yet it has not been subglacially ground. The glacier surface is a very effective transporting medium and though it may take some time, there is generally no restriction, other than climatic, on how far and how much debris can be transported by the glacier. In temperate glaciers, such as are in the Alps, there is very little subglacially transported material between the ice and the bedrock or debris frozen within the ice at the glacier sole. However, there is material which has become englacial by falling on to the glacier surface in the accumulation area; though this volume is slight compared with present day supra-glacial loads, it may constitute a considerable total over a period of time. One difficulty which hampers all estimates of glacial erosion (*sensu stricto*, i.e. subglacial processes) is knowing how much the originally extra-glacial material contributed to the actual volumes measured in any situation.

Unfortunately, examination of quartz grains by scanning electron microscopy is not much help. Supra-glacial material can look similar to that shown in Smalley, Krinsley & Vita-Finzi (1973, plate 1) and so can quartz grains from subglacial and en-glacial positions! Furthermore, supra-glacial grains may have some surface weathering and lightly cemented debris. Plate 1 (*a*) shows a supra-glacial grain from Feegletscher, Switzerland. Quartz redeposition can be seen together with some other debris. Present-day weathered material on cliffs also shows a wide variety of quartz redeposition though generally the surfaces were fairly clean after preparation. What does remain on the surface (after 5 minutes of boiling in 35% nitric acid) is not so much comminution

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