CRAIG HALL

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OS Grid Reference: NJ530292

Introduction

Forming the western margin of the main Insch intrusion, the Kennethmont granite–diorite complex comprises homogeneous granites (both pink and grey varieties) and diorites, together with a group of xenolithic rocks consisting of dioritic fragments in a granitic matrix (Gould, 1997). The complex as a whole is poorly exposed, but the principal components were mapped and described by Sadashivaiah (1954), who suggested that they are essentially unrelated to the 'Younger Basic' magmatic event. He concluded that they represent a later invasion of granitic magma which interacted locally with already consolidated basic rocks, similar to hypersthene-gabbros of the Insch mass, to produce hybrid xenolithic diorites. Read and Haq (1965) provided geochemical data to support these conclusions. Busrewil *et al.* (1975) re-investigated the Kennethmont granite–diorite complex, and recognized that the situation is more complicated than indicated by Sadashivaiah. They showed that two distinct magmas (granitic and dioritic) were responsible for the formation of the xenolithic rocks, and that the 'Younger Basic' rocks were not involved at all. They also realized that the pink granite member of the complex is unrelated to the other rock types, although it is probably of similar age. It has been dated at 453 ± 4 Ma (Pankhurst, 1982), and is probably one of the late tectonic granites.

Because of the poor exposure, and the way in which the principal components of the complex are distributed, it is impossible to identify a compact site in which they are all present. However, the Craig Hall area (Figure 3.18) is important in that the xenolithic assemblages, with diorite fragments in various stages of assimilation in a grey granitic matrix, are well represented. Although exposures are scarce, there is abundant loose material that is believed to be of very local derivation.

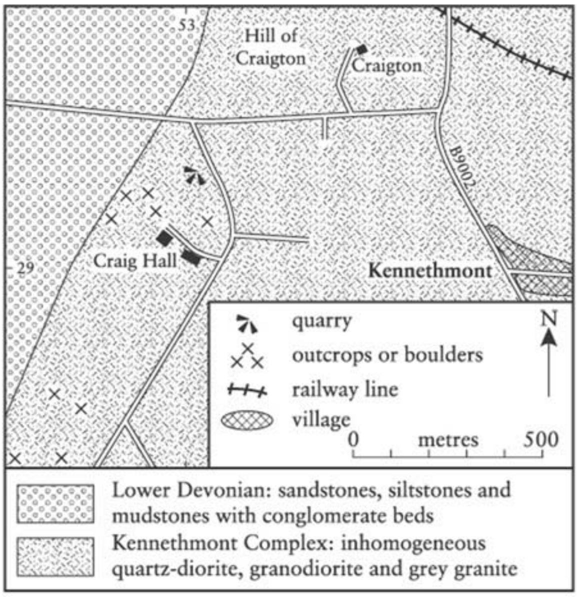

Figure 3.18: Map of the area around the Craig Hall GCR site, Kennethmont, from unpublished BGS maps.

Description

All gradations occur between rocks consisting of relatively coherent dioritic xenoliths in apparently unmodified grey granite matrix, to more granodioritic material containing small (millimetre to centimetre) mafic inclusions, with rounded or irregular shapes; these are believed to represent residual, partly digested, xenoliths. The grey granite comprises quartz, microcline, oligoclase and biotite (with minor titanite and apatite), and appears to show all gradations to granodioritic compositions, as plagioclase becomes the dominant feldspar. The dioritic xenoliths are relatively mafic, with pyroxene (mostly clinopyroxene, but some orthopyroxene) hornblende, biotite and titanite all present, although biotite is usually the dominant mineral. Plagioclase (An_{35}) is the principal felsic constituent, although small amounts of quartz occur in some samples. The mafic inclusions in the granodiorite consist of biotite and hornblende. The inclusions are typically finer grained than the acid matrix, and they show gradations from an igneous texture, with a few relict phenocrysts of plagioclase, to a distinctly granular metamorphic texture. Chemical data (Busrewil *et al*., 1975) show gradational relationships from the xenolithic basic material, through 'contaminated' rocks, with partly digested xenoliths, to the grey granitic matrix.

Interpretation

The xenolith-bearing granitic rocks of the Kennethmont granite–diorite complex clearly imply interaction between acid magma and a solidified basic component, but the origin of the latter, and the extent to which hybridization was capable of producing relatively homogeneous intermediate rock types (diorites), has been a controversial issue. Sadashivaiah (1954), followed by Read and Haq (1965) identified the 'Younger Basic' intrusions as the most likely source of the mafic xenoliths, since a variety of suitable compositions was locally available in the Insch intrusion. Of these the hypersthene-gabbros were regarded as the most appropriate protolith. Further, it was implied that the Kennethmont diorites represent the end-products of the hybridization process.

Busrewil *et al.* (1975) presented detailed chemical evidence (especially rare-earth element data) which effectively excluded any of the 'Younger Basic' components as the source of the xenoliths. Instead, they showed that there is considerable geochemical coherence between the dioritic xenoliths and the more homogeneous diorites found in the vicinity. They concluded that both diorite and granite magma were emplaced at about the same time, approximately 465 Ma ago (i.e. perhaps 5 Ma after the 'Younger Basic' event), and that locally the diorite crystallized first, to be invaded, disrupted and partly assimilated by the grey granite. A possible genetic connection between the diorite and grey granite component of the Kennethmont area was envisaged, but the pink granite component was shown to be unrelated, although of much the same age.

Conclusions

The Craig Hall area is of interest in that it provides evidence of a slightly younger magmatic event (the Kennethmont granite–diorite complex), spatially associated with the Insch intrusion, but apparently otherwise unrelated to it. In particular, it is of significance in the occurrence of xenolithic material, superficially resembling the 'Younger Basic' xenolithic complexes (see the Towie Wood site report), but of quite different origin (and age). The xenolithic assemblage of the Kennethmont complex essentially involved the interaction of two magmas (dioritic and granitic), whereas the typical 'Younger Basic' xenolithic association represents local partial melting of adjacent country rock.

Reference list

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