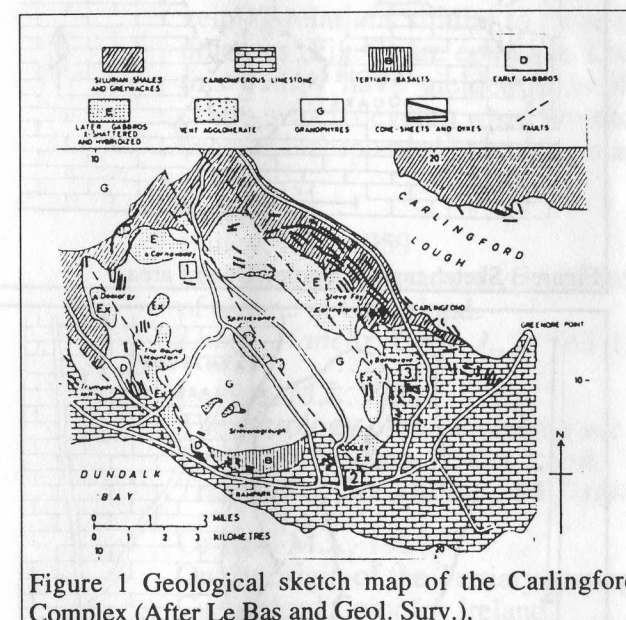


IRISH GEOLOGICAL ASSOCIATION FIELD GUIDE

The Carlingford Tertiary Complex

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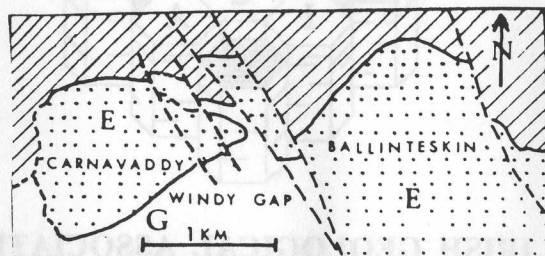


Figure 2 Sketch map of the Windy Gap area.

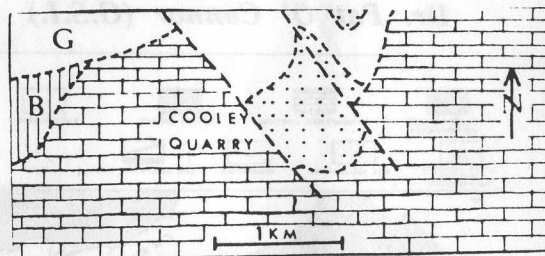


Figure 3 Sketch map of Cooley Quarry area.

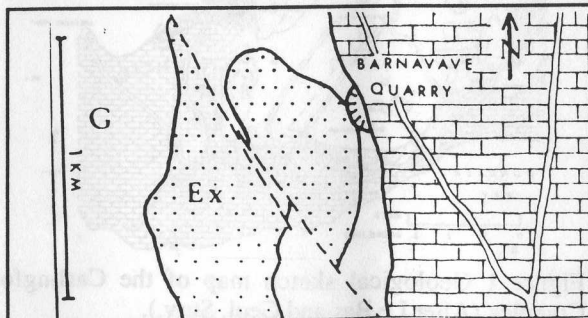


Figure 4 Sketch map of Barnavave Quarry area.

Geology of Carlingford

The Carlingford Complex (Co. Louth) represents the eroded roots of an ancient Tertiary volcano which was emplaced about 60 million years ago into older, tightly folded, Lower Palaeozoic sediments of the Longford Down Massif (Fig. 1). The southeastern part of the complex intrudes Carboniferous limestones. The complex itself is composed mainly of two igneous rock types termed gabbro and granophyre (with subordinate dolerite, basalt and hybrid rocks). The gabbros are dark, coarse grained rocks rich in mafic minerals which comprise the northern mountainous arc of the complex. They are thought to represent a flooded multilayer injection of basalt magmas over 365 metres in total thickness (Le Bas 1960). The gabbros (and finer grained dolerites) were followed in time by the intrusion of granophyres (pale fine grained granitic rocks rich in felsic minerals). The main granophyre occupies 30 km² in the central part of the complex and may have the form of a ring dyke (Le Bas 1967).

At numerous localities the dark gabbroic rocks have been invaded by the pale granophyric rocks resulting in intricate veining relationships. These relationships are thought to reflect the fact that two magmas, one mafic and the other felsic, co-existed (Bailey 1959). Limited magma mixing has occurred, resulting in hybrid rocks intermediate in composition between gabbro and granophyre (Nuckolds 1935).

Where the high temperature magmas of the Carlingford Complex have invaded the Carboniferous Limestone, a wide range of unusual calc-silicate minerals are developed in the limestone due to the intense heating (or metamorphism) induced by the hot magma.

While the basaltic rocks (i.e. gabbros and dolerites) were derived from considerable depth from within the earth's upper mantle, and injected into a high level in the crust during Tertiary times, much controversy still surrounds the origin of the granophyres or felsic rocks. These could have been derived from a process of differentiation from the basaltic rocks or, alternatively, through melting of pre-existing crustal rocks into which the basaltic rocks were emplaced. Sophisticated techniques, involving isotopic analysis of the different rock types of the Carlingford Complex, have been applied in an attempt to solve this problem (O'Connor 1988, 1990).

The object of a visit to Carlingford is to see what the root zone of an extinct Tertiary volcanic centre looks like, to examine the layered gabbros and the main granophyre mass together with the veining relationships which indicate contemporaneity of these two magmas of contrasted composition.

Locality Descriptions

Locality 1 Grid Reference : (J 130 138)

The Windy Gap area (Fig. 2) provides a readily accessible starting point at which the layered gabbros and the main granophyre may be examined. NW-SE faulting and associated crushing of the main granophyre may be seen

and some south dipping basic cone sheets also occur.

Locality 2 Grid Reference : (J 173 075)

The dolerites of Cooley Castle (Fig. 3) are well exposed and intricately veined by granite and granophyre. The dolerite - granophyre contacts are often fine grained, dark and crenulated. It has been debated whether or not they reflect primary liquid-liquid magmatic interfaces. Reaction between dolerite and granophyre is widespread and pervasive, and has led to the formation of hybrid rocks.

Locality 3 Grid Reference : (J 178 102)

Gabbro-granophyre hybrid rocks are exposed in the disused Barnavave quarry (Fig. 4) and veining relations similar to those in the Cooley dolerites (Fig. 2) are common. Loose blocks in this quarry have yielded examples of zoned skarns which develop when limestone xenoliths become incorporated in basaltic magma.

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Glossary

FELSIC - term for an igneous rock composed of light coloured minerals rich in Aluminium and Silicon.

MAFIC - term for an igneous rock composed of dark coloured minerals rich in Iron and Magnesium.

MAGMA - mobile molten rock generated within the Earth and capable of intrusion and extrusion.

RING DYKE - an arcuate or circular fracture into which magma has been injected and later solidified.