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## Geophysics

Geophysics is the study of the physical properties of geological materials and structures.

The modern science of geophysics embraces a very wide range of often extremely complex and sophisticated techniques for measuring such parameters as gravity variations, magnetic properties, natural radiation and seismic properties. Study of these enables interpretation of the form and nature geological structures, often at considerable depths beneath the surface, and the processes which may have created them.

An area's geophysics must therefore be viewed as another aspect of its geodiversity.

### Geophysics in County Durham

Much of our understanding of the deep structure of North-East England is derived from interpretations of a number of geophysical parameters.

In this section only those aspects of the area's geophysics which have most obvious impact upon geodiversity are considered. Key literature references from the substantial technical literature on the geophysics of Northern England, including County Durham, are listed in the bibliography.

During the 1950's, the North Pennines was a focus for early work on studies of gravity variations, stimulated by hypotheses which had earlier been proposed to explain the origin of the area's mineral veins. Certain key similarities between the mineral veins of the Northern Pennines with those of Devon and Cornwall led to speculation on the possible presence beneath the Pennines of a substantial body of granite. A detailed gravity survey of the Northern Pennines revealed a pronounced pattern of negative Bouguer anomalies which provided strong supporting evidence for a concealed granite. Drilling of the Rookhope Borehole in 1960–61 confirmed the presence of the Weardale Granite within the depth range suggested by the geophysical studies.

The demonstration of the close genetic relationship between the distribution of minerals in the Northern Pennine veins with the form and extent of the concealed Weardale Granite, represents one of the area's most important contributions to the understanding of similar orefields worldwide.

The pattern of Bouguer anomalies associated with the Weardale Granite are clearly discernible on the Gravity maps of the British Geological survey.

Magnetic anomalies due to iron-rich basic igneous rocks such as the dolerite of the Whin Sill offer a useful means of inferring the presence of such rocks at depth or where concealed by superficial or other geological materials. Interpretations of magnetic anomalies associated with these rocks have contributed greatly to research into the concealed form and likely origin of the Whin Sill within County Durham. Evidence from such studies fails to support suggestions that the Whin Sill may have been emplaced via a feeder beneath Upper Teesdale, but gives evidence for the emplacement of this suite of intrusions through the major bounding faults of the Alston Block, such as the Lunedale and Stublick faults.

The Whin Sill and associated intrusions are readily discernible on the Aeromagnetic maps of the British Geological Survey.

A number of seismic profiles, mainly through areas immediately adjoining the county, give important evidence for the deep structure of the Alston Block.

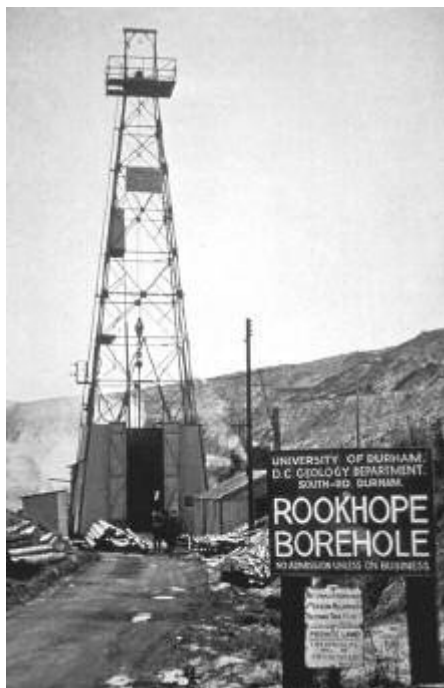
### Selected references

Bott and Masson-Smith, 1953; Bott and Johnson, 1970; Dunham, 1990; Dunham and Wilson, 1985.

## Photographs

(Photo 73) Rookhope Borehole, 1960–61. Dept. of Earth Sciences, University of Durham.

### [Full references](#)



(Photo 73) Rookhope Borehole, 1960–61. Dept. of Earth Sciences, University of Durham.