Metalliferous mineral veins, Geology and man, Midland Valley of Scotland

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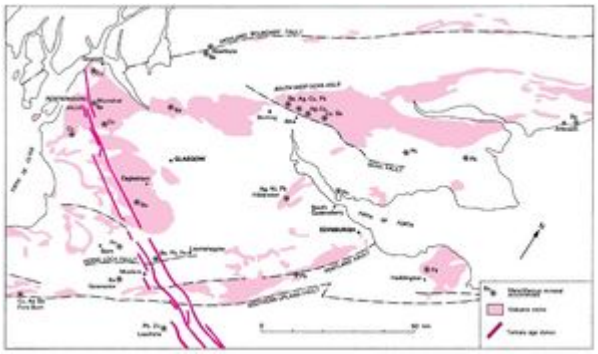
Metalliferous mineral veins



Recorded occurrences of metalliferous veins in the Midland Valley. P915552.

Metalliferous mineralisation is not widespread in the Midland Valley. Baryte, however, has been mined with profit until quite recently from two areas and several small mines and numerous trials were worked in the 19th century and earlier for baryte, copper, lead, iron, silver, nickel and cobalt. The more important occurrences are shown on P915552.

Mineral veins are for the most part concentrated in three areas: in Lower Devonian volcanic rocks of the south-western Ochil Hills, in the Lower Carboniferous Clyde Plateau Lavas of the Renfrewshire Hills, and in Silurian, Devonian and basal Carboniferous rocks in the Muirkirk–Lesmahagow area. Outwith these areas mineralisation is mostly associated with Carboniferous volcanic rocks and limestones or with quartz-dolerite intrusions.

Baryte

Over 800 000 tonnes of baryte have been produced from the region, accounting for a third of the

total UK production between the years 1940 and 1966. Almost all of this output was from vein deposits at Muirshiel in the Renfrewshire Hills (300000 tonnes; closed 1969) and at Gasswater near Muirkirk (500 000 tonnes; closed 1963).

At the Muirshiel Mine two intersecting NNE–SSW and E–W veins occur at the faulted northern margin of the Misty Law Trachytic Centre, within the Clyde Plateau Lavas. Over forty other recorded baryte veins in the area occur mostly within the trachytes and occupy several fracture directions, but particularly NW-SE fractures which are also occupied by later Tertiary dykes. Baryte veins in trachytic rocks also occur in NW–SE fracture zones south of Eaglesham.

At Gasswater Mine four main veins trend between WNW and NNW in hard sandstone units within an Upper Devonian to Lower Carboniferous sequence. The mine is on the margin of a larger zone of baryte, galena and hematite mineralisation in Silurian to Lower Carboniferous age sediments and Lower Devonian acidic sills around Muirkirk (e.g. Nutberry Hill, River Nethan and Auchinstilloch). Many small veins trend NW–SE, subparallel with the Tertiary dyke swarm which passes through the area, although a major control for vein distribution seems to be the NE–SW Kerse Loch Fault.

In the south-western part of the Ochil Hills, baryte occurs as a gangue mineral in most mineral veins and is the major constituent of the more frequent NW–NNW-trending veins particularly in the areas around Blairlogie and Menstrie. At Aberfoyle worked veins trend between NW and NNW in Lower Devonian sediments near the Highland Boundary Fault.

Copper

In the south-western part of the Ochil Hills many of the veins contain copper, which is particularly notable in the NW-trending baryte veins from which it was formerly extracted at several localities. The principal ores consisted of chalcopyrite, chalcocite and tetrahedrite, with some native copper, chrysocolla and malachite.

Copper mineralisation occurs in a variety of environments in the Renfrewshire Hills. Most occurrences are in the Clyde Plateau Lavas in the form of veins containing chalcocite, bornite, chalcopyrite and secondary malachite in a baryte gangue (e.g. Kaim Mine, Lochwinnoch) but in mines near Gourock disseminations of malachite occur in massive sandstones below the lava sequence. Native copper is recorded from basalts in a few localities (e.g. Boyleston Quarry, Barrhead).

The Fore Burn dioritic complex is affected by widespread tourmalinisation and local disseminated copper-antimony sulphide mineralisation. Traces of cobalt and gold also occur in a breccia zone.

Silver-nickel-cobalt

Small amounts of silver were produced from Hilderston in the Bathgate Hills and from Alva in the Ochil Hills in the early seventeenth and eighteenth century respectively. At Hilderston, vein mineralisation containing baryte and niccolite with some native silver occurred in an E–W fault-plane, adjacent to a quartz-dolerite dyke. The country rocks are clastic sediments of the Lower Limestone Group within a predominantly volcanic succession. Annabergite (nickel bloom) and erythrite (cobalt bloom) are also recorded. Near Alva, several veins contain native silver and argentite with erythrite in a gangue of calcite and quartz. The most important mine was at Silver Glen, Alva, where both silver and cobalt were extracted.

Lead-zinc

Several veins containing galena and rarely sphalerite cut Silurian sediments in the Nutberry Hill–River Nethan area, Muirkirk. In Fife there are several noted occurrences of galena associated with Carboniferous limestones and/or quartz-dolerite intrusions, and some extraction took place. Galena is present in some of the Ochil mines, including Silver Glen, Alva. At Hilderston, galena and sphalerite were extracted from deeper levels of the silver-bearing vein and from an adjacent vein, both in limestone.

Low grade, stratabound, disseminated zinc-lead mineralisation has recently been discovered in the Lower Limestone Group close to Hilderston Mine and in the Calciferous Sandstone Measures at South Queensferry.

== Iron == Hematite has been mined from veins in thick trachyte flows at Garleton, near Haddington and in Silurian sediments at Auchinlongford, near Sorn. Veins of hematite are also recorded from the Auchinstilloch area and ferruginous gouge material occurs in many of the Ochil veins.

Age of the mineralisation

Mineral veins cut rocks ranging in age from Llandovery to topmost Dinantian and are cut by Palaeocene dykes. The mineralisation cannot be regarded as the product of a single event and veins were probably emplaced during several tensional regimes from the late Caledonian to the Mesozoic.

The rock alteration and mineralisation within the Lower Devonian dioritic complex at Fore Burn may be a late Caledonian event.

Many of the copper, lead and iron-bearing veins are associated with E–W fracture systems of post-Westphalian age and would seem to be part of the major Hercynian mineralisation episode of the British Isles. Several such veins are closely associated with quartz-dolerite intrusions and a Stephanian age is therefore indicated, in agreement with K-Ar dates on vein gouge clays from the Ochils of 300 to 280Ma.

Baryte is a constituent of many of the Stephanian age veins but significantly most of the major baryte veins either occupy NW–SE fractures or occur within a 20 km-wide, NW–SE zone, coincident with the main Tertiary dyke swarm (P915552). It has been suggested that this north-westerly control may indicate a Tertiary age for the mineralisation. However, it seems more likely that the Tertiary dykes occupy an older mineralised fracture system, possibly dating back to the Carboniferous. Unpublished radiometric dates from the Gasswater baryte deposit of 287 to 270 Ma suggest a late Carboniferous or Permian age, but the Muirshiel deposit is probably of Triassic age (240–213 Ma). Palaeomagnetic measurements on a baryte-hematite vein from Auchenstilloch point to a still younger Lower to Middle Jurassic age. It is possible that most of the Midland Valley baryte veins originated from an early Mesozoic cycle of magmatic and hydrothermal activity, recognised throughout NW Europe and probably related to the early opening of the North Atlantic.

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