

REPORT

Black baryte from Derbyshire

A long-standing problem in Peak District mineralogy has been the source of the black baryte recorded by Prof G. Koenig in 1878. He provided a short note about a single specimen with the locality recorded simply as *Derbyshire*. It was then specimen no. 5435 in the mineral collections of the National Academy of Sciences in Philadelphia, USA, but how it reached there is unknown.

The Koenig specimen was borrowed and photographed some 45 years ago when the brown stalactitic baryte (oakstone) of Arborlow was being studied by Ford and Sarjeant (1964), but at that time they were unable to throw any light on the provenance of the black variety (Fig. 1). The Academy has recently been re-named the National Academy of Biological Sciences and the mineral collections have been sold. The black barite is currently on its way back to England, into the collection of the second author, when renewed study may reveal more about it.

The only other published reference is a listing by Greg & Lettsom (1858) who noted black baryte at Middleton-by-Youlgreave without any other details. However, a specimen of black baryte was obtained by C.S.Garnett (of Derby) around 1920 and was recorded as from Smerrill Grange when Garnett's collection was acquired by Gregory, Bottley & Co in the 1930s. The specimen subsequently passed into Bob King's collection (Fig. 2) and thence into the National Museum of Wales collections in Cardiff, where it is today (NMW 83.41G.M.8792). Smerrill Grange covers a substantial area near Middleton-by-Youlgreave and a further hint at the provenance is that there was a manganese mine working from at least 1881 to 1904 at Mount Pleasant Farm, about 900 m west of Smerrill Grange (SK190619); there were two other mines nearby (Burt et al. 1981, p86). The Ordnance Survey map marks two shafts 100 m or so NW of the Mount Pleasant Farm.

XRD analysis showed baryte with no obvious contamination though the black colour was attributed to inclusions of manganese (letter from Tom Cotterell of NMW to R.J. King, 22nd Feb. 2007).

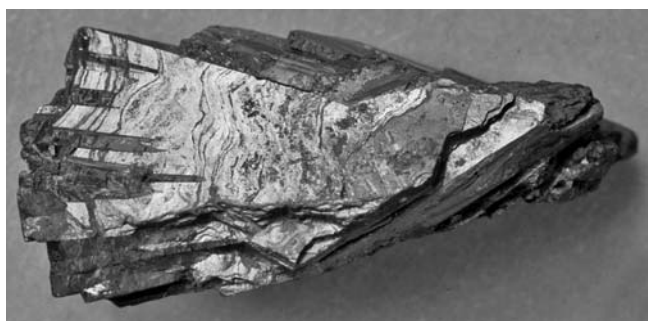


Figure 1. The Koenig specimen of black baryte, that was in Philadelphia; the specimen is about 50 mm long.



Figure 2. The Bob King specimen of black baryte, now in the National Museum of Wales.

One of us (J.A.J.) has recently found black baryte (Fig. 3) comparable to Koenig's specimen during exploration of an old lead mine (SK255563) on Red Rake (also known as Foulslow Wells Vein: Flindall, 2006) which crosses Marks Dale, a southern branch of the Via Gellia. Red Rake and other veins were worked intermittently 1874-1920 from adits on both sides of the dale. This black baryte was in the eastern adit, which is 72 m long, and is known to have been worked in 1879.

The black baryte of Koenig's specimen matches both Marks Dale and Mount Pleasant specimens, so it is here proposed that either of these could have been the original locality for Koenig's specimen. However, the similarity of the last known working date for Marks Dale (1879) with Koenig's note (1878) supports the former locality. Some of the black crystals in the Marks Dale adit have white terminations suggesting that growth continued after the wad ran out.

As most Derbyshire baryte is white or cream-coloured, with occasional pink, red or brown varieties, black baryte naturally attracted attention in the 19th century. How Koenig obtained his specimen is unknown, but he was curator of the geological collections in the Natural History Museum in South Kensington. He evidently had more material as he was able to analyse some, presumably by wet chemistry. He found 3.1% MnO_2 , implying that the colour was due to an admixture of manganese wad. Indeed wad was found adjacent to baryte in the Marks Dale vein.

Analyses of the Marks Dale material by SEM Energy Dispersion have determined: BaO_2 56.562 and 63.552%; SO_2 19.588 and 23.895%; MnO 3.556 and 2.115%, with small amounts of aluminium, iron, silica, potassium and calcium oxides. The manganese figures compare with Koenig's and demonstrate that 2-4% manganese wad is sufficient to cause the black colouration.

Figure 3. A John Jones specimen of baryte that forms black blades up to 10 mm long, with white tips, in vein material from Red Rake (see also colour photo on back cover).



Copy of Koenig's Note

as recorded in TDF's files about 1963.

Koenig, G.A. 1878. Black barite from Derbyshire. *Proc. Nat. Acad. Sci. Philadelphia*. Pp.99-100

A brief report on the examination of a specimen in the academy's collection labelled "Manganese from Derbyshire". It is jet-black in colour with a metallic lustre. Lamellar structure without distinct form. Strong cleavage giving angles of barite. Specific gravity 4.345. On boiling in HCl lost black colouring and left a white substance.

Analysis: BaSO₄ 96.40%; Mn₂O₃ 3.10%; H₂O 0.25%. Total 99.75%

There remains a chronological problem. Manganese wad in Derbyshire was deposited within sedimentary fills in caves during Plio-Pleistocene times (Ford, 2001, 2006) whereas the main mineralization, including baryte, was late Carboniferous (Plant & Jones, 1989). Secondary redistribution of baryte is known elsewhere in the mineral field, so it is quite likely that the black baryte coloured by wad was a feature of a late episode of mineral re-distribution. Furthermore the black baryte is strongly fluorescent with a straw colour under ultra-violet light and this has only been found in secondary baryte elsewhere in the Peak District, e.g. the nodular grey baryte in Masson Hill open cast pit.

Acknowledgments

Thanks to Dr R.J.King for his useful comments and to Tom Cotterell of the National Museum of Wales, Cardiff, for his comments on an early version of this note and for supplying photographs of their specimen.

References

- Burt, R., Waite, P., Atkinson, M. & Burnley, R., 1981. *The Derbyshire Mineral Statistics 1845-1913*. University of Exeter and Peak District Mines Historical Society, Matlock. 141 pp.
- Flindall, R., 2006. Mine levels in Marks Dale, Via Gellia. *Peak District Mines Historical Society Newsletter* **120**, p. 5.
- Ford, T.D., 2001. Derbyshire Wad and Umber. *Mining History (Bulletin PDMHS)*. **14**, (5), 39-45.
- Ford, T.D., 2006. Manganese Mining in the Peak District. *Mercian Geologist*, **16**, (3), 200-202.
- Ford, T.D. & Sarjeant, W.A.S. 1964. The Stalactitic Barytes of Derbyshire. *Proc. Yorkshire Geol. Soc.*, **34**, (4), 371-386.
- Greg, R.P. & Lettsom, G. 1858. *Manual of the Mineralogy of Great Britain and Ireland*. 483 pp. London.
- Koenig, G.A., 1878. Black barite from Derbyshire. *Proceedings of the National Academy of Sciences, Philadelphia*, 99-100.
- Plant, J. & Jones, D.G., 1989. *Metallogenic Models and Exploration Criteria for Carbonate-hosted Ore Deposits – an interdisciplinary study in Eastern England*. British Geological Survey and Institution of Mining and Metallurgy. 161 pp.

Trevor D. Ford
Geology Dept., University of Leicester, LE1 7RH
John A. Jones
31 Bridgefields, Kegworth, Derby DE74 2FW