The Wheal Martyn 'Boulder Park' and its role in geological conservation

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The Wheal Martyn SSSI is a small, artificially created, outcrop of unkaolinized granite; selected to demonstrate the typical parent granite which, if kaolinized, would yield good quality china clay. Geologists involved with the china clay industry have long thought that it would be worth placing a series of boulders alongside the SSSI in order to demonstrate the wide range of the rock types to be found in china clay pits. Twelve boulders, weighing up to two tonnes, have now been brought to the site. These include the five principal granite types found in the western half of the St Austell granite, a stockscheider pegmatite, an elvan, quartz-tourmaline vein material and Wheal Remfry breccia.

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The S.S.S.I at Wheal Martyn

About 20 years ago, as part of the Geological Conservation Review, a series of sites around the St Austell granite were under discussion. One of the sites was required to demonstrate unaltered granite which, if it had been kaolinized, should have yielded good quality china clay, ideally in a position where it would not compromise future china clay working.

Such a site was found on the hillside above Wheal Martyn Museum (now renamed 'The China Clay Country Park'), 3 km north of St Austell (SX 005555). An earlier exploration borehole had found hard nearly fresh granite just below the surface at this locality. This was ideally placed from a conservation standpoint, as it would be convenient for visitors, with appropriate curatorial capacity available from the museum.

ECC then provided the earthmoving plant to dig down to the granite and expose a suitable sized area of granite. The scientific recording of this Site of Special Scientific Interest was carried out by Colin Exley, and was published in the GCR Volume on "Igneous Rocks of SW England" (Floyd *et al.*, 1993).

The S.S.S.I. has now had an explanatory panel added by English Nature and is passed by many visitors to Wheal Martyn, as it is adjacent to the footpath leading from the viewing area which enables visitors to look down into the active Wheal Martyn and Greensplat china clay pits.

Geological conservation and the china clay industry

Wheal Martyn (SX 003554) was set up around thirty years ago to be a museum and heritage centre for the china clay industry. The museum is housed in a complex of old refining and drying buildings associated with the early development of Wheal Martyn and adjoining china clay pits, and tells the story of how the china clay industry developed, both in technical and social terms. It is set in 10 hectares of grounds which includes many interesting and historic features and a viewing platform which provides a superb panoramic view of the active Wheal Martyn (Imerys) and Greensplat (Goonvean) china clay pits. The museum has always had a strong educational role and many parties of schoolchildren and students visit it. It also has an important and rapidly growing role in preserving the archives of the china clay industry. A booklet, intended for the general reader, describing the geology of the china clay area, with notes on the minerals, environmental aspects and world kaolins, has just been published (Bristow, 2006). There are also many scientific papers describing the geology of the china clay pits – see the bibliographies included in Hawkes *et al.* (1987), Bromley (1989), Bristow and Exley (1994) and Manning *et al.* (1996).

Conservation of geological information about the china clay pits is becoming an urgent matter, as many china clay pits which showed features of considerable geological interest, formerly operational in the late 20th century, are now closed, or about to be closed, due to contraction of the industry. Once closed the pits rapidly fill with water and the slopes revegetate, or they are backfilled with china clay waste such as mica residue. Except in a few exceptional situations, it becomes practically impossible to preserve the faces once visible in the pit.

The conception of the 'Boulder Park'

Recently it has also become more difficult to arrange visits into active china clay pits because of Health and Safety requirements, so many parties which formerly visited the operational pits now have to visit Wheal Martyn Museum instead.

Figure 1. *Two young visitors inspect the boulder of Wheal Remfry breccia in the Wheal Martyn Boulder Park.*

Location and lithology	SiO_2	Al_2O_3	K_2O	Na_2O	CaO	MgO	Fe_2O_3	TiO_2	Li (ppm)	L.O.I
1. Biotite granite, Goonbarrow pit (SX 009/583)	73.28	14.34	4.76	2.92	0.74	0.43	2.09	0.26	665	1.14
2. China stone, Great Wheal Prosper quarry (SX 954/564)	73.17	15.54	3.92	4.30	1.62	0.00	0.03	0.04	32	1.45
3. Globular quartz granite, Goonbarrow pit (SX 007/580)	73.73	14.94	4.50	3.35	0.43	0.00	0.99	0.08	1114	1.01
4. Topaz granite, Treviscoe pit (SW 948/559)	73.00	15.39	4.25	4.08	0.49	0.00	1.06	0.04	1401	1.27
5. Lithium mica granite, Gunheath pit (SX 005/569)	71.69	16.00	4.64	2.83	0.48	0.00	0.98	0.04	3714	1.55
6. Pegmatite (stockscheider), Wheal Martyn pit (SW 999/560)	68.73	17.02	8.66	2.15	0.24	0.00	1.38	0.03	60	1.09
7. Felsitic elvan (partly kaolinized), Wheal Remfry pit (SW 926/577)	75.48	16.27	2.36	0.08	0.05	0.00	0.92	0.05	120	5.13
8. Quartz-tourmaline vein, Wheal Martyn pit (SW 999/558)	93.92	3.65	0.03	0.22	0.09	0.54	0.99	0.02	112	0.50
9. Wheal Remfry breccia (three samples), Wheal Remfry pit (SW 924/574)	74.55 -77.80	12.67 -14.51	1.23 -3.32	3.35 -4.98	0.54 -0.55	0.26 -0.75	0.71 -1.25	0.10 -0.12	80 -130	0.92 -1.13
10. Schorl with pseudomorphs after feldspar, Wheal Remfry pit (SW 924/576)	77.25	14.69	2.85	0.97	0.12	0.46	1.77	0.09	152	1.84
11. Fluorite on granite, Wheal Martyn pit (SW 998/561)	73.62	14.95	4.85	3.41	0.57	0.00	1.02	0.09	687	1.20
12. Lithium mica granite with turquoise and iron staining, slight kaolinization, Gunheath pit (SX 005/568)	70.60	16.13	6.11	1.51	0.66	0.00	1.14	0.03	3416	2.30

Table 1. *XRF major element analyses carried out by Fiona Thomas at Camborne School of Mines, University of Exeter on the 12 boulders. Values in wt% except for lithium, which is given as ppm (L.O.I. = loss on ignition). The National Grid references are for the original location of the boulder in the china clay pit.*

Right from the time that the S.S.S.I. was set up, ECC geologists had the idea that large boulders should be brought to a site adjoining the Wheal Martyn S.S.S.I., in order to demonstrate the wide range of hard rock types to be found in china clay pits. With the appointment of a new Director, David Owens, and substantial developments at the Museum, a renewed determination to set up the 'Boulder Park' was born. The first step was to involve English Nature, in order to ensure that there was no objection to locating the Boulder Park adjacent to the SSSI. Accordingly English Nature visited Wheal Martyn to discuss the idea.

The identified aims were: (1) To give visitors to Wheal Martyn Museum an idea of the nature and origins of a wide range of interesting rock types found in china clay pits. (2) To give a wide range of educational parties a chance to learn about granite geology and the formation of mineral deposits, in support of their studies. (3) For the site to act as a repository for large specimens of any unusual rock types which exist in china clay pits, which may be lost due to pit development, backfilling or flooding following closure.

English Nature was supportive, so the task of collecting the specimen boulders began. With the help of Imerys and Goonvean, 12 boulders weighing up to two tonnes apiece have been brought to the site. Table 1 provides details of the locations and chemistry. Small descriptive panels have been placed alongside each boulder giving general descriptions (Figure 1). The booklet on the geology of china clay (Bristow, 2006) includes further background information about the boulders.

In addition there is the granite exposed in the S.S.S.I., which is described on the explanatory panel put up by English Nature and in Floyd *et al*. (1983). Also, about 100 m away, are two large pillars at the bottom of the drive which formerly led up to Carthew House, which are composed of an exceptionally coarse grained granite from one of the quarries around Luxulyan, which represents the earliest phase of granite intrusion in the St Austell pluton (Bristow and Exley, 1994; Bristow, 2005, 2006). Each of the boulders in the Boulder Park has been sampled and analysed at Camborne School of Mines (small quantities of sample are available from C.S.M.). Preliminary results are set out in Table 1.

These analyses confirm the established chemical characteristics of these rocks and allow for some preliminary comments. The biotite granite has the highest iron content, reflecting the iron contained in the biotite mica, which makes it the least attractive parent granite for kaolinization. The china stone has by far the lowest iron content, which shows why it is such an attractive material for use in high quality ceramics. The high K_2O content of the stockscheider pegmatite reflects the high potash feldspar content of this boulder. The high loss on ignition for the elvan confirms that it is partly kaolinized. The exceptionally high lithium content for boulder 5 at just over 3700 ppm is one of the highest Li values obtained in south-west England (see Hawkes *et al*., 1987). The wide variation in values for the Wheal Remfry breccia reflects the inhomogeneous nature of this rock. It is hoped that a future paper will give fuller analytical data and describe the detailed petrography of the boulders.

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References

BRISTOW, C.M. 2005. *Cornwall's Geology and Scenery (2nd Edition)*. Cornish Hillside Publications, St Austell, 109-112.

BRISTOW, C.M. 2006. *China clay – a geologist's view: geology, minerals, environment and world kaolins*. Cornish Hillside Publications, St Austell.

BRISTOW, C.M. and EXLEY, C.S. 1994. Historical and geological aspects of the china clay industry in south-west England. *Transactions of the Royal Geological Society of Cornwall*, **21**, 247-314.

BROMLEY, A.V. 1989. *Field Guide to the Cornubian Orefield*. Sixth international symposium on water-rock interaction, Malvern, U.K., 1989. Published by Camborne School of Mines on behalf of the International Association of Geochemistry and Cosmochemistry, pp111.

HAWKES, J.R., HARRIS, P.M., DANGERFIELD, J., STRONG, G.E., DAVIS, A.E., NANCARROW, P.H.A., FRANCIS, A.D. and SMALE, C.V. 1987. The lithium potential of the St Austell Granite. *Report of the British Geological Survey*, **19**, No. 4.

MANNING, D.A.C., HILL, P.I. and HOWE, J.H. 1996. Primary lithological variation in the kaolinized St Austell granite, Cornwall, England. *Journal of the Geological Society, London*, **153**, 827-838.

FLOYD, P.A., EXLEY, C.S. and STYLES, M.T. 1993. *Geological Conservation Review Series No. 5: Igneous Rocks of South-west England*. Chapman and Hall, London, 141-208.

VARIOUS CONTRIBUTORS. 2002 – 2006. Volume One containing Newsletters 1-14 of the China Clay History Society. The China Clay Museum, Wheal Martyn, Carthew, St Austell.