History and importance of minerals from the Mendip Hills, UK

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The Mendip Hills is a relatively small area in SW England near the city of Bristol (Fig.1) that is characterised by rolling limestone hills, farmland and a wealth of karstic features including caves, gorges and sinkholes. The Carboniferous Limestone here hosts a number of lead-rich mineral deposits which have been worked since ancient times and the area has a rich, but very ancient and often long forgotten mining heritage, which may, according to some explain its name - a corruption of *"myne deepes"*

The earliest confirmed miners in the region were the Romans, who conveniently left behind a processed lead ingot, inscribed with the date AD 49. The Romans worked lead from small surface pits and might have ventured underground to find ore when the natural cave systems intersected lead rich deposits. Mining in the region was however not just limited to lead, ochre was mined from the 13th Century and copper, zinc and manganese were all extracted at one time or another.

Unfortunately for scientists the vast majority of the economic mineralisation was removed from the area before the end of the 18th Century, which in the UK was just about the time when the disciplines of mineralogy, chemistry and crystallography were beginning to come together. Furthermore, around the same time, museums were becoming established and many well educated, wealthy and often powerful individuals were broadening their knowledge through the collection of objects pertaining to Natural History.

As a consequence, scant mineralogical information has been recorded with regards to the early mining that went on, and very few specimens from this period are preserved within mineral collections for physical study. One of the only collections in the UK that covers the Mendip Hills when it was actively being mined is the collection of John Woodward (1665-1728) whose collection is now preserved in Cambridge University.

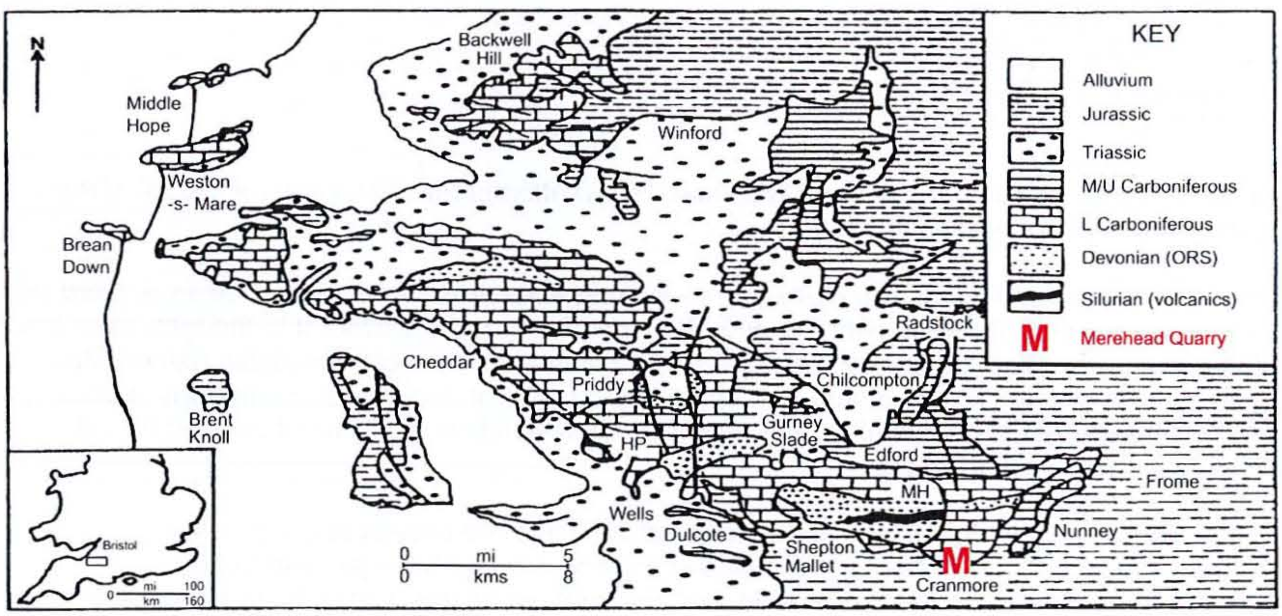
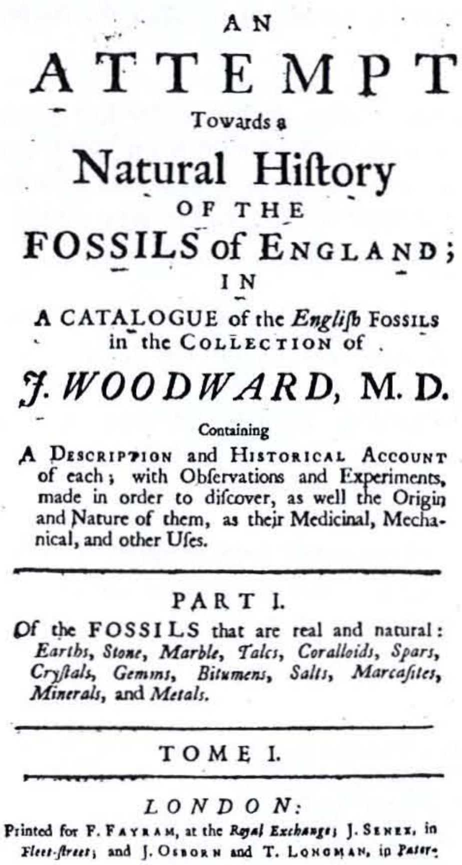


Fig.1. *Local geological Map of the Mendip Hills area, indicating the regions geographical position within the UK and the exact position of Merehead (Torr Works) Quarry, which is the most mineral diverse locality in the region to date.*

Woodward wrote a book, published in 2 volumes, one in 1728 and the other posthumously in 1729 entitled *"An Attempt towards a Natural History of the fossils of England"* (Fig. 2). At this time it should be noted that any object sourced from the ground be it mineral or fossil was called a "fossil" and the book covered in great detail descriptions of a number of 'earths', 'ores' and 'spars' that we can now reasonably identify as recognisable mineral species or their varieties. A rough tally indicates that Woodward was aware of about 11 different minerals from the region at this time. Although it should be noted, that many did not have mineral names as we have them now and were instead given names derived from the combination of chemical and physical information. For example, pyromorphite which was one of the main ores of the region was *"lead ore of a popinjay green colour"*. This description is certainly the first reference to pyromorphite within the British Isles and is the starting point for the significance of the Mendip Hills to UK mineralogical studies.


AN
ATTEMPT
Towards a
Natural Hiſtory
OF THE
FOSSILS of ENGLAND;
IN
A CATALOGUE of the *Engliſh* FOSSILS in the COLLECTION of
J. WOODWARD, M. D.
Containing
A DESCRIPTION and HISTORICAL ACCOUNT of each; with Obſervations and Experiments, made in order to diſcover, as well the Origin and Nature of them, as their Medicinal, Mechanical, and other Uſes.

PART I.
Of the FOSSILS that are real and natural: *Earths, Stone, Marble, Talcs, Coralloids, Spars, Cryſtals, Gemms, Bitumens, Salts, Marcaſites, Minerals,* and *Metals.*

TOME I.

LONDON:
Printed for F. FAYRAM, at the *Royal Exchange*; J. SENEX, in *Fleet-ſtreet*; and J. OSBORN and T. LONGMAN, in *Pater-*

Fig. 2. *Xerox of the title page of John Woodward's "An attempt towards a natural history of the fossils of England" published in 1729.*

One of the more ambiguous 'minerals' within Woodward's work is his reference to a *"lead ore, flakey, and striated...'Tis white with the eye of Yellow"* from *"near Bristol"*. It is thought, although it cannot be proved, that this may correspond to the mineral we now call Mendipite named after the region of this study. If this could be somehow proved it would be particularly significant, representing one of the earliest if not the earliest type description of a mineral species from the UK dating all the way back to 1728.

Unfortunately, it seems that this is something that will never be proven and it should be noted that the now established concepts of systematics in science only really began with Linnaeus in the late 1750's anyway. However, the white 'lead ore' material, whatever it may have been called, was clearly known to be something distinct and worthy of note as it began to turn up in other mineral collections in the latter part of the 18^{th} Century (eg. - Pennant 1757) (Fig.3). In 1797 the first figured specimen of mendipite appeared in the work of Philip Rashleigh listed as a *"solid white lead ore"*. The NHM collections now include this figured specimen which came to the Museum in 1964 within

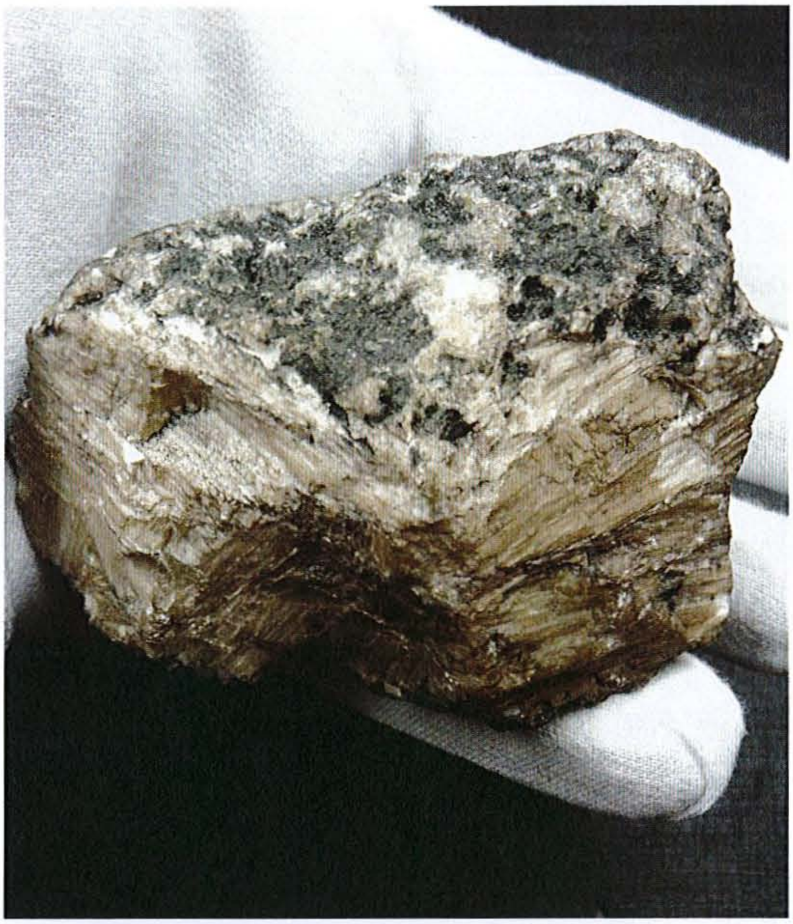


Fig. 3. *A specimen of mendipite from the Pennant Collection in the NHM, London – Interestingly this specimen is incorrectly labelled as being from Wales. The specimen is approximately 10 cm long.*

the collection of Sir Arthur Russell. It is worth noting that the specimen is almost in exactly the same form as it was nearly 220 years ago (Figs. 4a & b).

Surprisingly it took a further 26 years for a name to be given to this well known, but rare white lead ore from the Mendip Hills. This name, *"Saltsyradt Bly"* came in 1823 along with the first chemical analysis, performed by Berzelius, who identified from the onset the correct chemical nature of the substance, a lead oxychloride. After several nomenclature iterations by a number of significant mineralogists the name that endured was proposed by the relatively unknown mineralogist Glocker, who suggested the term *"Mendipite"* in his Handbuch der Mineralogie in 1839.

The length of time, over 100 years, from discovery to naming is an indication of how different the world of science and the fledgling discipline of mineralogy was at this time. Currently if a period of more than a couple of years passes between discovery and naming mineralogists seem to consider the mineral to be problematic.

For a while after the naming of mendipite, the Mendip Hills it seems once again fell into mineralogical obscurity. It can be surmised from the scarcity of mendipite in early collections that there was very little mendipite available to collectors and all the material that was available was of historic origins with poor locality data, presumably because the significant mining in the area had stopped. It was not until much later in the 1890's once systematic mineralogy is firmly established, that the opening of a very small manganese mine in the Mendip Hills called the Higher Pitts Mine began to shed some new light on the origins of mendipite and the potential significance of the whole region.

Fig. 4a. *The drawing of a "solid white lead ore" Philip Rashleigh's "Specimens of British Minerals selected from the cabinet of Philip Rashleigh" (1797-1802).*

Fig. 4b. *The specimen of what had become called 'mendipite', featured in Philip Rashleigh's Book, as it now stands in the Russell Collection at the NHM. The specimen is approximately 15 cm long.*

A local collector, Spencer George Perceval began collecting at Higher Pitts and informed one of the mineralogists at the British Museum, Leonard. J. Spencer of the intriguing finds that he was making in this small mine. Spencer visited the locality in 1898 and began amassing specimens for research within the collections at the British Museum (Natural History) (NHM). These specimens consisted of powdery, black manganese oxides rich with internal lead mineralisation that included mendipite almost identical in appearance to the mendipite specimens of 100 before.

Although systematic mineralogy was established, technology was still limited to describing only those new minerals that occurred in significant amounts – and unfortunately for Spencer, it took 25 years to obtain enough material to fully study the whole suite of minerals that he had been working on. Finally, in 1923 Spencer published an important paper that covered a number of relevant points all at once. His paper confirmed a locality for mendipite within the Mendip Hills region, redefined the dubious and often disregarded mineral crednerite, contained the first consistent chemical analysis on hydrocerussite and most significantly, defined two entirely new minerals which he called chloroxiphite (Fig. 5) and diaboleite (Fig. 6), which like mendipite were lead and chlorine rich minerals.

Fig. 5. *Green blades of chloroxiphite within lilac-pinkish mendipite, from the collections at the NHM. The specimen is approximately 10 cm long.*

The Mendip Hills had now become an important mineralogical locality for the UK and the region was also becoming globally more significant as the only known source of chloroxiphite and diaboleite and the worlds best source of crednerite, hydrocerussite and mendipite.

However, once again mining in the region stopped and even though the area was clearly very special from a mineralogical point of view no further discoveries were made for a number of years. The 1940's saw a time when topographic mineralogy was becoming more important in the UK and trips to collect minerals from old or unusual mining localities was seen as a recreational hobby as well as a scientific endeavour. It was at this time that Arthur Kingsbury, added a number of new finds to the area and although he was unable to find any species new to science, he seems to have increased the number of known species from the Mendip Hills area to around 40.

Thankfully for UK mineralogists, the potential of the Mendip Hills region was finally realised with the opening of several large aggregate extraction quarries working the Carboniferous Limestone. The most important and well known of these quarries is the Merehead or Torr Works quarry, (Fig. 1) although several quarries in the area have produced significant finds of the unusual manganese 'pod' hosted lead mineralization.

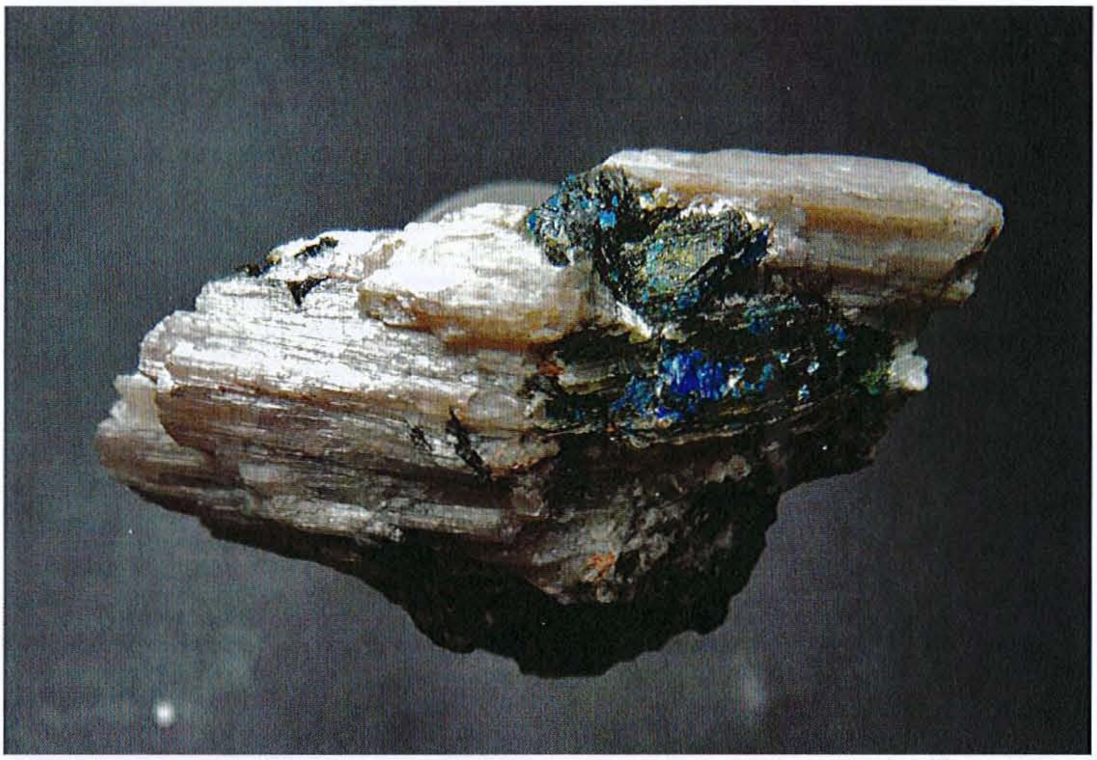


Fig. 6. *Blue diaboleite embedded within greenish chloroxiphite alongside unidentified minute orange grains (probably mereheadite) within white mendipite, from the collections at the NHM. Specimen is approximately 5 cm in width.*

It was these quarries and the access that mineral dealers and collectors had to them during the 1960's through to the 1990's that lead to the observation of the full geological context of the assemblage and three more entirely new mineral species. It is interesting to note that the origins of these 'pods' are still being debated and a number of models have been proposed, but as yet the genesis of the whole region is still under debate.

The three new minerals, like Spencer's two before them were studied at the NHM and their characterization took many years to complete. Eventually the three minerals were named parkinsonite (Fig. 7) (1994), mereheadite (Fig. 8) (1998) and symesite (Fig. 9) (2000). These papers along with a number of topographic publications in UK based journals and newsletters brought the number of known minerals in the Mendip Hills region up to around 70, and firmly placed the Mendips and specifically the manganese oxide hosted lead mineralisation therein as one of the most significant mineral collection sites within the UK, and probably the most important site in the UK for mineralogical research. Several of the minerals found in the manganese pods are still yet to have been conclusively confirmed from elsewhere and the whole assemblage has not yet been repeated.

It is both the uniqueness of the deposit and the tradition for curators and researchers at the NHM to specifically investigate this locality that has spurred further investigation of it at the NHM in the last few years. A fortuitous encounter with local mineral collector, Rick Turner enabled not only the re-investigation of older material already in the museum, but also new material discovered in recent excavations within Torr Works (Merehead) Quarry. This new material has lead to the redefinition of chloroxiphite and mereheadite, instigation of a re-assessment of symesite, the potential definition of a number of related phases, an entirely new magnesium rich lead mineral related to the oxychlorides, named rickturnerite (Fig. 10) and, a further lead oxyhalide approved by the IMA CNMNC, and due for publication later this year.

Fig. 7. *Red parkinsonite within striated mendipite, with minor black plattnerite from the collections at the NHM. Scale bar divisions are equal to 1 mm.*

Fig. 8. *Orange granular mereheadite, with embedded green chloroxiphite and intermixed pale pinkish-white mendipite from the collections at the NHM. The specimen is approximately 5 cm in height.*

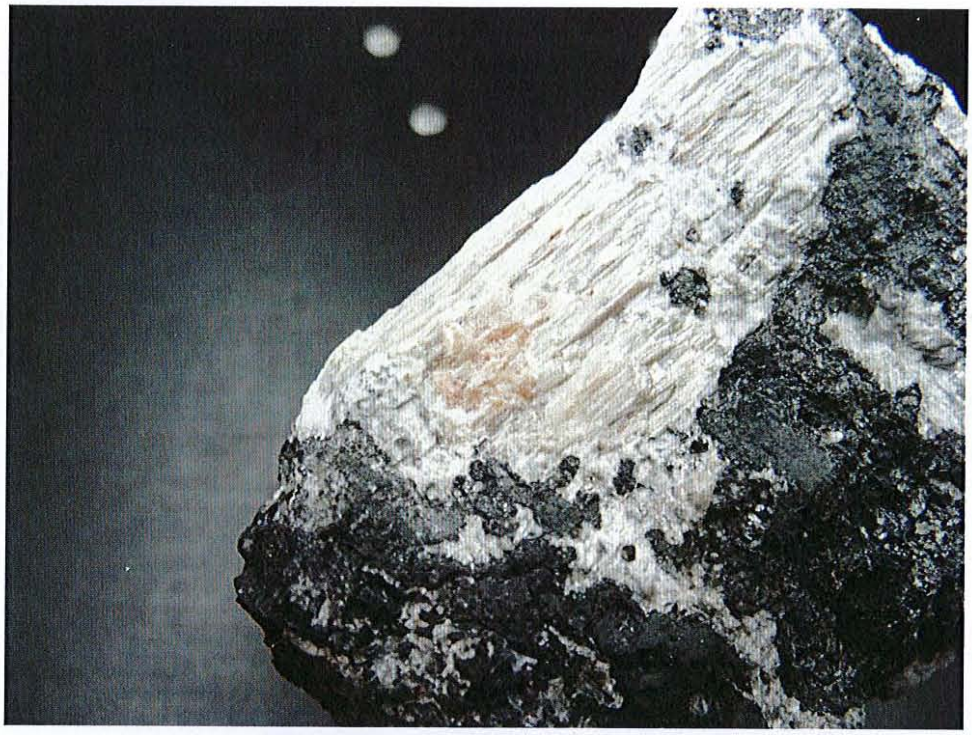


Fig. 9. *Salmon Pink, Symesite embedded within white mendipite, from the collections at the NHM. The specimen is approximately 4 cm in width.*

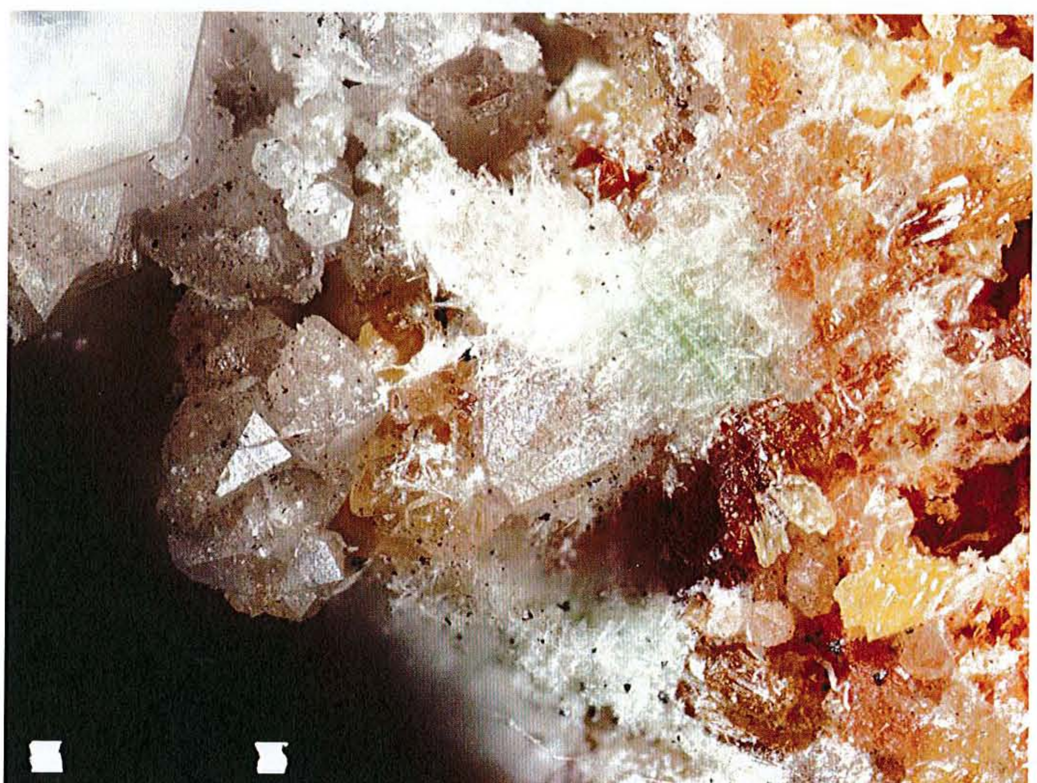


Fig. 10. *Pale fibrous green through white, rickturnerite nestled upon orange mereheadite with white hexagonal prisms of what is probably the poorly understood 'plumbonacrite'. The scale bar division represents 1 mm.*

Of the most interest however, is the unexpected discovery during an investigation of the lead oxychlorides of a lead carbonate phase that is already known to most chemists as 'plumbonacrite' (Fig. 11). A term that has been shunned and entwined with nomenclatural problems since its original definition in 1889. Our work has been able to show that given the right environmental and geochemical conditions plumbonacrite does exist in nature as suggested informally by Kolitsch *(on the web forum www.mindat.org)* and a proposal indicating that it should be re-instated as a valid mineral species is currently under review with the IMA CNMNC. It hoped that this will also be approved and published again, later on in 2012 or early 2013.

The potential for new minerals and significant scientific research is clearly high within the Mendips, and a number of intriguing phases are still being investigated. However further potential may lie in exploring the vague similarities that exist between parts of the mineral assemblage in the Mendips and the deposits at; Langban in Sweden, Kombat in Namibia and Tiger in Arizona, all of which contain some of the same minerals and a rich wealth of lead oxychloride related phases, but in different geological environments. Investigation of these deposits has already lead to the discovery of two new phases from Kombat mine, vladkrivovichevite and hereroite, and comparisons between all the sites may eventually solve the debate over the problematic origin of the Mendip Hills deposit.

Fig.11. *White hexagonal prisms of what is probably the poorly understood mineral 'plumbonacrite'. The large hexagonal prism at the bottom left is 1 mm in width.*

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