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HISTORIC MINERAL FEATURE

A History of Chromite and Copper in Maryland: The Tyson Years

by
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Introduction

A complete history of chromite and copper mineralogy and mining in Maryland would necessarily include a portion about the history of geology itself. There are multiple levels of information available, from the local and detailed through those concerning regional implications, and on to the broad theory about origin that could be applied both to other occurrences of these minerals as well as to basic questions of rock emplacement. In this article I will discuss some specific locations of chromium and copper and their associated minerals, their history, and their mineralogy. The driving force behind chromite and copper exploration and mining was, of course, economic. While uses for copper certainly evolved during the nineteenth century, copper as the metal and in compounds has been known since antiquity. Chromium had recently been discovered, and much was learned about its chemistry and uses during the nineteenth and early twentieth centuries. The current environmental implications of the long history of metals mining and treatment in the Baltimore area will also be discussed.

Literature

There is a wealth of literature available; including Maryland and U.S. Geological Survey reports, bulletins, and information series papers, that range from the very technical to the easy to read. Among these are detailed reports done before suburban development obscured many of the sites. There are publications in technical journals such as the *American Journal of Science, Economic Geology*, and in journals and special papers of

the Geological Society of America. Industrial histories contain information of interest as do books that include chapters about germane topics. Another source, historical journals, present interesting and important topics, and that is also true of articles found in popular magazines about the state. There are also newspaper stories and personal communications, such as letters to consider. Some of these are recent and some date back to the nineteenth century. I have seen one comment written by a man whose family was personally involved in mining. As a perpetual reminder for the necessity of caution with sources, his first sentence contained two er-

"Although he traveled widely in pursuit of his many ventures, his letters reveal a man who was touchingly devoted to his family."

rors about mining history that contradict numerous other primary and secondary sources. Information concerning ownership, royalty payments, and environmental problems, can be found in legal and court records. The final source, is manuscripts. Those I know of are in state historical society libraries. The reference list for this article contains only sources I used.

Uses of Chromium and Its Compounds

In order to understand the increased use of chromium ore in the U.S. through the nineteenth century, it is helpful to review its discovery and why there was a growing interest in chromium. Chromite, discovered in

1798 in the Ural Mountains (Ostrander et al. 1946,4) is the double oxide $\text{FeO} \cdot \text{Cr}_2\text{O}_3$, with substitutions of other +2 and +3 cations. It has been written as $(\text{Mg}, \text{Fe}^{+2}) (\text{Cr}, \text{Al}, \text{Fe}^{+3})_2\text{O}_3$. The substitutions determine the suitability of different ores for different uses. For example, to be used as a refractory material the aluminum content must be high, while for metallurgical use the chromic oxide content must be high. For chemical use the aluminum content should be low, but the iron content is not a concern (Pearre & Heyl 1960,730).

In the reference material I used there was some disagreement about the discovery of the first chrome mineral. The Allied Chemical reference says it was first described by Lehman in 1762. Ostrander et al. said it was done by Pallas in 1765. The mineral was the brilliant orange-red crocoite found in the Ural Mountains. The mineral was analyzed by Marquart and Vauquelin, and in 1789 they reported "this mineral was an intimate combination of the superoxygenated oxide of lead and the iron of alumina." (Vauquelin 1789+,279) The earlier analysis proved incomplete and incorrect. Vauquelin later reported the results of a series of analyses that demonstrated the presence of a new metal and characterized its chemical reactions. There is some argument about whether he or Klaproth was "first" and also over whether Vauquelin's method produced the metal or the carbide, but credit usually goes to him for the metal. On the advice of Fourcroy and Haüy, Vauquelin called it "chrome," not for the color of the metal itself, but for the colors of its many compounds. This, and the function of the compounds in

other chemical processes, led to immediate uses. Chromite is found in much larger masses than crocoite, and is the only ore of chromium.

The literature records the rather slow beginning of the chrome chemical business. A few places in Europe, and later in the U.S., were able to effect the "opening" of the recalcitrant ore. The first process required potassium nitrate, which was expensive. Later, less expensive methods were found. In terms of uses, it is interesting that as late as 1916 it was stated that "metallic chromium has no direct uses." (Ries 1916,791) Electroplating of the metal was not effective until a few years later. Early applications included using the ore as a refractory for lining blast furnaces, adding it to an increasing range of chemicals, providing a substitute for more toxic pigments, and, somewhat later it was added to toughen chrome steel. By 1928 Singewald stated that its major use was in metallurgy. By 1960 Allied Chemical listed an extensive range of uses for their chrome chemicals including dyeing, tanning, electroplating, and many others.

Isaac Tyson, Jr.

The many threads of chromite exploration and development in Maryland and Pennsylvania, as well as those of copper and iron mining and smelting, were brought together by Isaac Tyson, Jr. (Fig. 1) Tyson (1792-1861) was more of an industrialist and a technologist than a scientist, although knowledge and respect for science played a large role in his successful career. He led and participated in a multiplicity of activities that included mining and minerals exploration, metal smelting and production, and the establishment of necessary industrial and transportation facilities. He read copiously, including cherished copies of *Les Annales des Mines*. For a while he was president of a fire insurance company in Baltimore (Abbott 1965b,23). He is best known as the person who recognized, explored for, and exploited chromite and other metallic ore deposits in Maryland, Pennsylvania, California, and elsewhere. In addi-

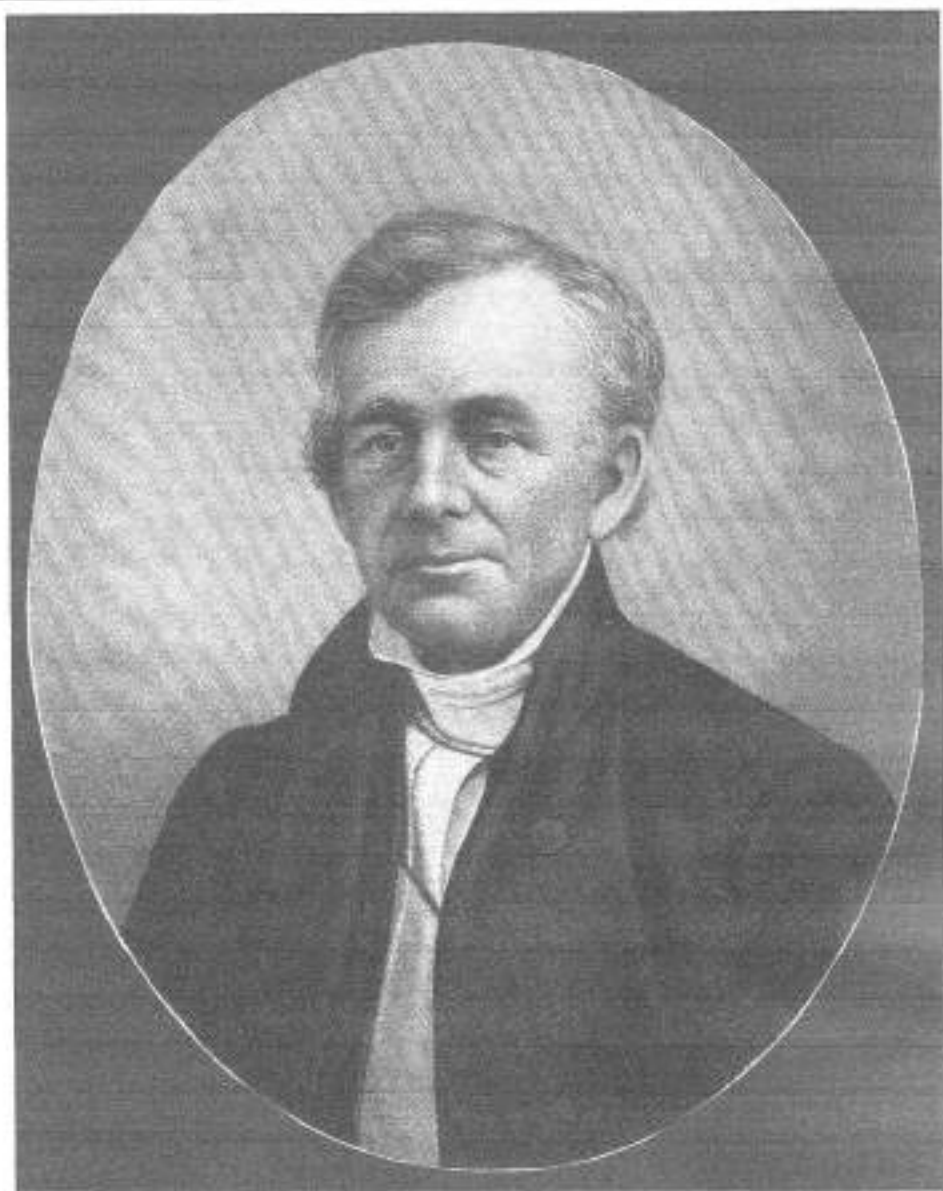


Figure 1. Issac Tyson, Jr. Photo engraving from a private collection.

tion, Tyson predicted that eventually production of chrome chemicals would be more profitable than mining the ore and shipping it elsewhere.

"The manufacture of chemicals, paints, medicines, etc. was commenced at Baltimore, by Messrs. Howard Sims and Isaac Tyson, who erected a laboratory on Pratt street. They afterward removed it to Washington Avenue, and were incorporated in 1822. They became extensive manufacturers of copperas, and of chromate of potash, chrome yellow, and other chromic pigments from the chromate of iron at Bare Hills, Maryland, and in Chester County, Pennsylvania." (Bishop [1868]1966,231)

"Opening" of the ore to produce pigments was expensive at first, but despite supposedly improved processes, Tyson made three different attempts

to produce bi- or dichromates at his Back Bay location. He was finally successful in 1845. A statement by Glenn in *Maryland: Its Resources, Industries and Institutions, Baltimore, 1893*, credits Tyson with being the first American manufacturer to employ a technological chemist trained at a university (Yale); his name was W.P. Blake. In 1827 Tyson received a patent for making copperas, $FeSO_4$ (Abbott 1965b,19). In 1831 he was chairman of the Committee on Chemistry of the General Convention of the Friends of Domestic Industry. This committee's report, given in New York, described the necessity for a domestic supply of chemicals for both financial and de-

fense reasons (Haynes 1954, V.1, 207). In 1834 Tyson received a patent "for an improvement in the mode of heating and applying heated air to blast furnaces" (Tyson 1835, 407). This method required the use of anthracite coal. While it is very difficult to establish a "first" for the use of either hot blast or anthracite in this application, Tyson is credited with probably being the first to apply it to copper (as opposed to iron) smelting.

Tyson was born in Baltimore to a Quaker family. His father, Jesse, was a grain and flour merchant who transported his wares in a fleet of clipper ships. The "Jr." is apparently in reference to his grandfather, another Isaac. Although he traveled widely in pursuit of his many ventures, his letters reveal a man who was devoted to his family. Two of his sons entered family businesses, and had distinguished careers. Jesse became his father's partner in the chemical business, while James owned and operated mines and furnaces for the Tyson firms. They were abolitionists and some accounts state that they employed no slaves in mining, although Maryland is south of the Mason-Dixon line.

Tyson was aware of the presence of chromite at Bare Hills north of Baltimore as early as 1808 or 1810. Tyson's first big commercial-size discovery of chromite was in 1827. Recognizing the connection of serpentine barrens to chromite, he explored from Montgomery County in Maryland through the state line district in Pennsylvania, and became the first chief supplier of chromite ore in the world, and later the major producer of chrome chemicals in the U.S.

Also in the 1820's, Tyson became involved in mining and smelting copper. Along with others, he owned or leased most of the copper sources in Maryland. He invested in copper refined from copperas production in Vermont, and it was there he built his hot blast, anthracite-fueled copper smelter. It is interesting to study the inception of companies that we are familiar with in the twentieth century during the early production of metals and chemicals in the eastern United States. While larger, more economical chromite and copper ore sources were later found and exploited, smelting and chemical production remained in Baltimore for many years.

Chromite

Reports of the discovery of chromium in Maryland are somewhat confused. I have seen three different dates given, from 1808 until 1827. If the earliest dates are to be believed, the first discovery location was Bare Hills, north of Baltimore. There is also some disagreement about the beginning of chrome chemical manufacture. One of the earliest references to the chrome discovery was that of H.H. Hayden in 1833. It seems probable that he was correct, since he also wrote an earlier article about Bare Hills, published in 1814 in *The American Mineralogical Journal*. In 1833 he returned to Bare Hills in order to write a more complete description. Hayden (1833, 349) credited a Mr. Henfry with the discovery of chrome, titanium, and other minerals. In other accounts Henfry was identified as a gardener who worked for Isaac Tyson, Jr.'s father at his summer estate in Bare Hills. From England, Henfry had worked with chrome chemicals, recognized the dark, heavy chromite, and showed it to the younger Tyson who had studied chemistry by that time (Ostrander et al. 1946, 7). There is some disagreement among sources

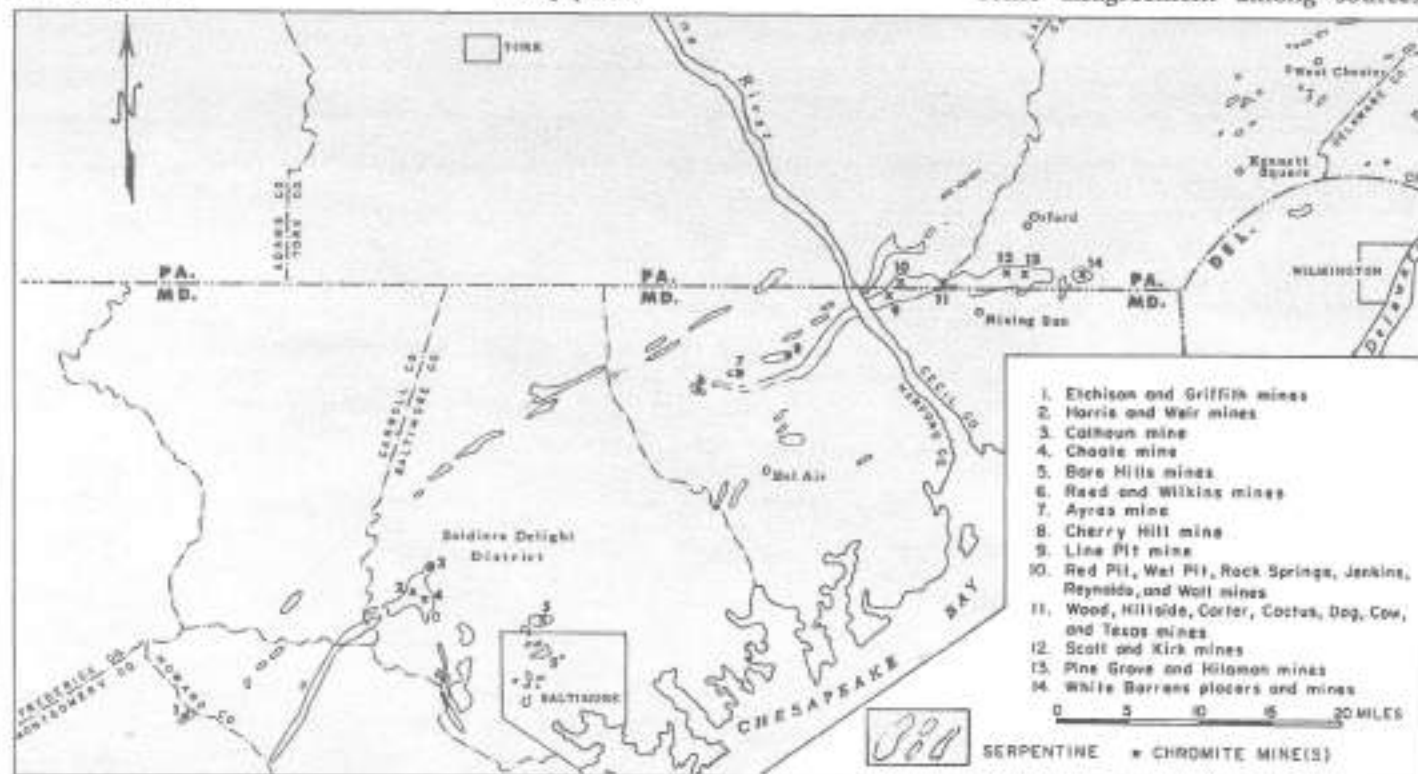


Figure 2. Index map of Maryland and Pennsylvania chromite mines and their relationship to ultramafic rocks, after Heyl and Pearre, 1960.

about when Tyson actually became involved in mining chromite as well as the time and sequence of chrome chemical manufacture.

Chromite location and origin

Chromite occurs in Maryland and Pennsylvania in a somewhat dismembered band of serpentinized ultramafic rocks that stretches from Montgomery County, Md., to the northeast into Pennsylvania (Fig. 2). More detail is shown in some plates in Pearre & Heyl, 1960, as well as in county and quadrangle maps. An entire article could be written concerning the history of ideas and the origin of these rocks and their subsequent emplacement. These ideas represent a very interesting case regarding change in interpretation of geology itself, as well as being intimately entwined with the interpretation of broad questions in the regional geology and chronology of the Piedmont.

Bare Hills

Hayden included in his article a map showing approximately a mile and a half near Falls Turnpike at Bare Hills, and identified rock types and mineral locations (see Fig. 3). His excellent mineral descriptions were keyed to map locations. The current Falls Road still crosses the summit of what Hayden called the serpentine formation, and on either side are old quarries. Until fairly recently the quarry on the east was not posted against trespassing. These quarries for building stone were probably begun in the 1890's, and by the 1950's were no longer in use (Pearre & Heyl 1960, 726). A retired stonemason in one of my classes spoke of working with stone from these quarries, and was delighted to return to the source and discuss current thinking about its geologic emplacement.

Cleaveland included a description of the chromites at Bare Hills in his 1816 treatise on mineralogy. After discussion of the chemical characteristics of chromite in its various forms he quoted the earlier article by Hayden:

"In Maryland, at the Bare Hills, near Baltimore, all its varieties occur, and some of them abundantly, in veins, or in masses, in serpentine. The crystals are found in channels, worn by water in the sides of the hill, and the ser-

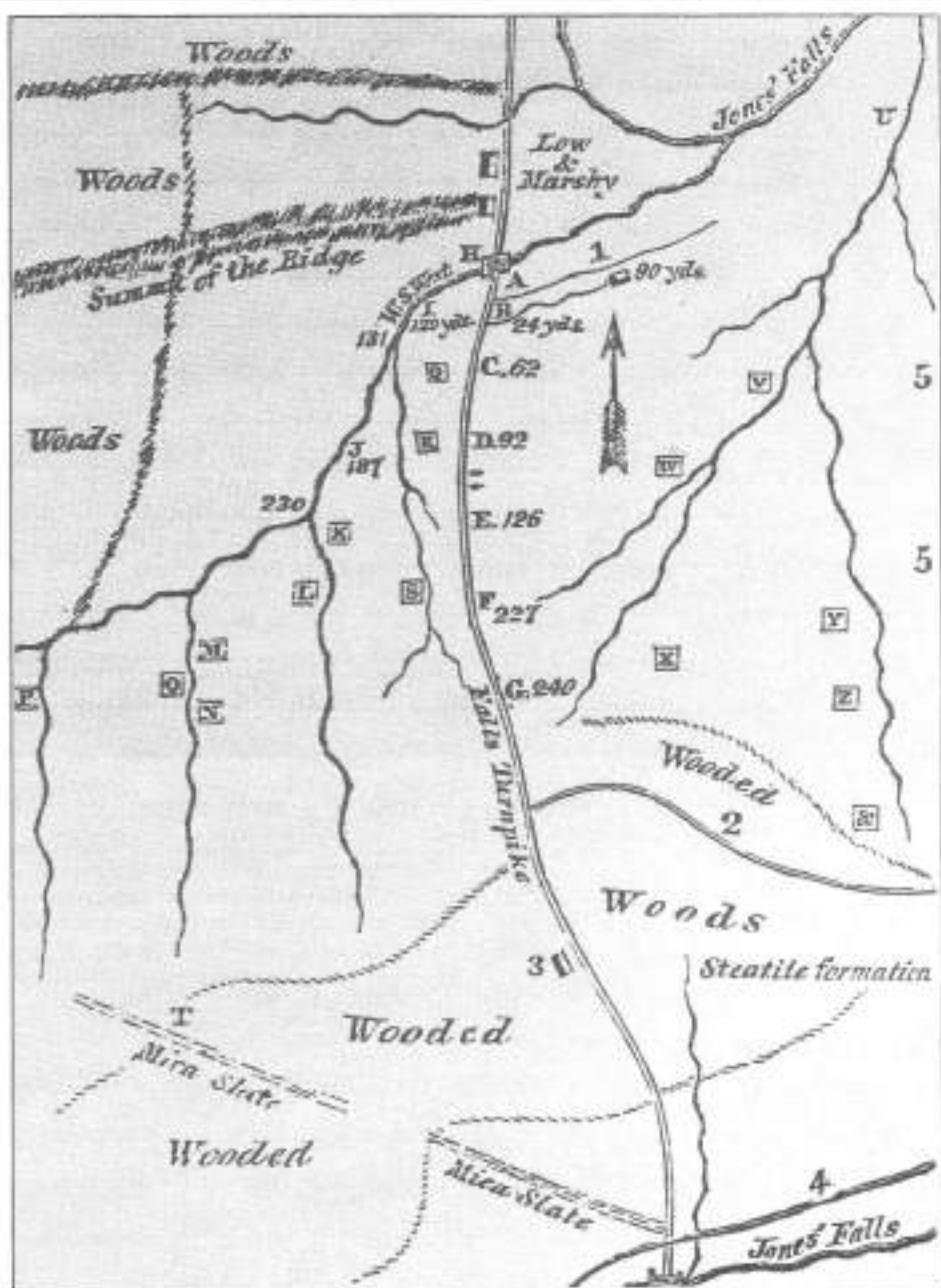


Figure 3. Hayden's map of the Bare Hills area, 1833. 1: Foot path; 2: Road leading to gunpowder works; 3: Small house in woods; 4: Railroad; 5: Eastern slope of Bare Hills.

pentine is here traversed by veins of indurated talc. Many of the crystals are injured by attrition. They are mixed with sand and the granular variety. The granular variety occurs either loose, as already mentioned, or is disseminated in an indurated steatite or serpentine. The amorphous variety is associated with talc, steatite, etc. in serpentine." (Cleaveland [1816]1978, 507-8)

In 1833 Hayden cataloged a number of places where chromite had been removed or prospected for at Bare Hills. He mentioned one opening of about 80 feet in depth. Os-

trander et al. (1946) said they found 32 mining localities, some large, some small. Pearre and Heyl mapped the main workings in the 1950's, and included them in their 1960 publication. In the mid-1980's I attempted to find some vestige of these workings and was not successful. There may well be some remains, but suburban expansion, commercial creep with its accompaniment of asphalt, and No Trespassing signs, combine to discourage exploration. The east side

quarry is best for seeing minerals typical of serpentinite.

It would probably be difficult to find many of the minerals Hayden described in 1833. He recognized "real" serpentinite, and that much of what he saw was instead an aggregate. He said:

"It is true that real serpentinite exists in this district, and that even noble serpentinite, in small specimens has been found here; but, the aggregate mass of the rocks of these hills, according to the classification of Brongniart, to which I know of no one that is preferable, falls under the denomination of ophiolite, which he describes as being "a paste of serpentinite enveloping acidulous iron and other accessory minerals disseminated."—Hence Brongniart describes as "principal varieties," ferriferous ophiolite, chromiferous ophiolite, diallagic ophiolite and garnetic ophiolite—all of which, with the exception of garnetic ophiolite, are found, at nearly every point of the Bare Hills." (Hayden 1833,351).

The word "ophiolite" has had changed genetic meanings over time, but seems always to have been applied to the same sort of rock and mineral assemblage.

In 1946 Ostrander et al. said that while Bare Hills had been a popular collecting site, good minerals could still be found. He listed six kinds of serpentinite, chromite, talc, hyalite, chalcedony, opal, moss-agate, sepiolite, magnesite, chlorite, rhodochrome, deweyllite in chalcedony, pyroxene, hydromagnesite, and something he called dendritic wad. In the 1950's Pearre and Heyl could still see some of the mine dumps and listed minerals there. While not nearly as numerous, typical minerals such as chromite in disseminated grains, serpentinite, magnetite, talc, chlorite, and magnesite can still be found in the quarry.

Reed Mine, Harford County

* In 1827, at a Baltimore market, Tyson identified some heavy dark rocks used to keep a cider barrel from rolling as chromite (Glenn 1896,487). Glenn gave a detailed description of what Tyson found when he traced those rocks to their point of origin at a farm in Harford County, 27 miles northeast of Baltimore. He found a great quantity of chromite on the surface in a woodland in "strange con-



Figure 4. Rhodochrome (chromian antigorite) from the Choate Mine, 2 x 4." Specimen collected by L.B. Mather, 1933. Fred Parker collection, photo by Gary Grenier.

trast" to nearby, normal, fertile soils. There,

"The forest trees were of stunted growth, displaying a poverty of limbs and of foliage which indicated a deficient supply of natural sustenance. Of grass and of herbage there existed but little; and, in consequence, the face of the land was scarred with paths formed by running waters." (Glenn 1896,487)

Tyson immediately bought the farm and began shipping ore to Baltimore, where it was then eventually shipped to Glasgow where chrome chemicals were made. Tyson also made the connection between "serpentine barrens" and the presence of chromite,

leading to the discovery of and the opening of the Soldier's Delight mines as well as exploration from Montgomery County to and across the border into Pennsylvania.

The Reed Mine was said to be one of the most productive. Apparently the ore body was "80 feet long, 25 feet wide, and 4 to 8 feet thick. It is said that the total output was about 100,000 tons." (Knopf 1922,86) This information is quoted by Pearre and Heyl in 1960, while Knopf herself cited Glenn (1895) and Day (1883-4). Glenn said that besides the larger ore body, nearby there were

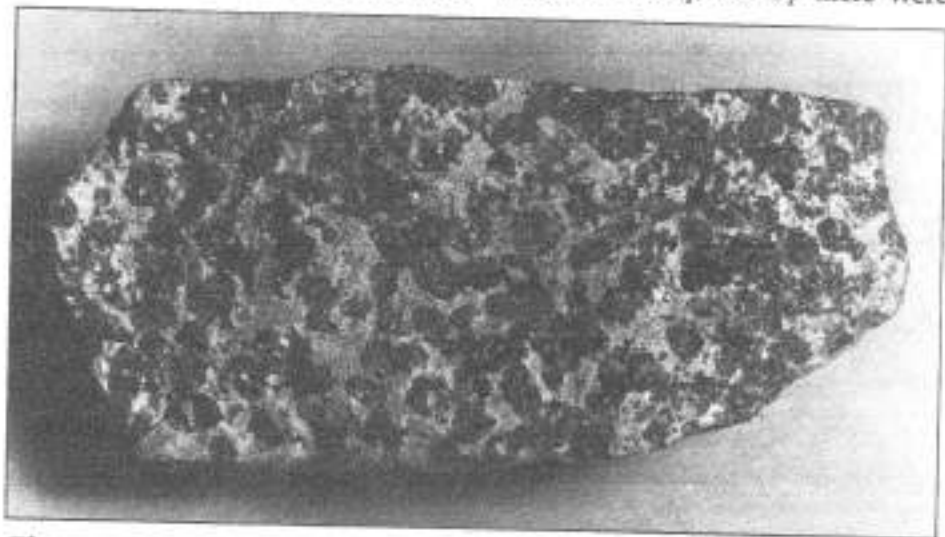


Figure 4. Chromite crystals disseminated in serpentinite, from the Choate Mine. Photo courtesy of the Natural History Society of Maryland.

two smaller ones. Singewald included a sketch of the surface of the mined area, and noted that

"the mine was worked at two different periods, for a number of years upon its discovery and again some time after 1860 until it was abandoned about 1880." (Singewald 1928,181).

At this time the dump included fresh serpentine, talc, and disseminated ore. Some of the latter was shipped to a concentrating mill (Singewald 1928,182).

The Reed mine was one of those reopened in 1922 after World War I. While the main shaft was filled with water when Pearre and Heyl investigated, in oral communication with local people they learned more details about the mine and the ore body. They had a sample of massive ore from a dump analyzed, and reported seeing talc, kämmererite, chromian antigorite, serpentine, magnesite, and brucite (Pearre & Heyl 1960,764).

The Wood Mine

About the Wood mine, in Lancaster Co., Pa., Knopf said:

"It contained the largest single body of chrome ore ever known, and for some years during the early prosperous days of the Pennsylvania chrome industry it furnished practically the entire world's supply of chrome ore." (Knopf

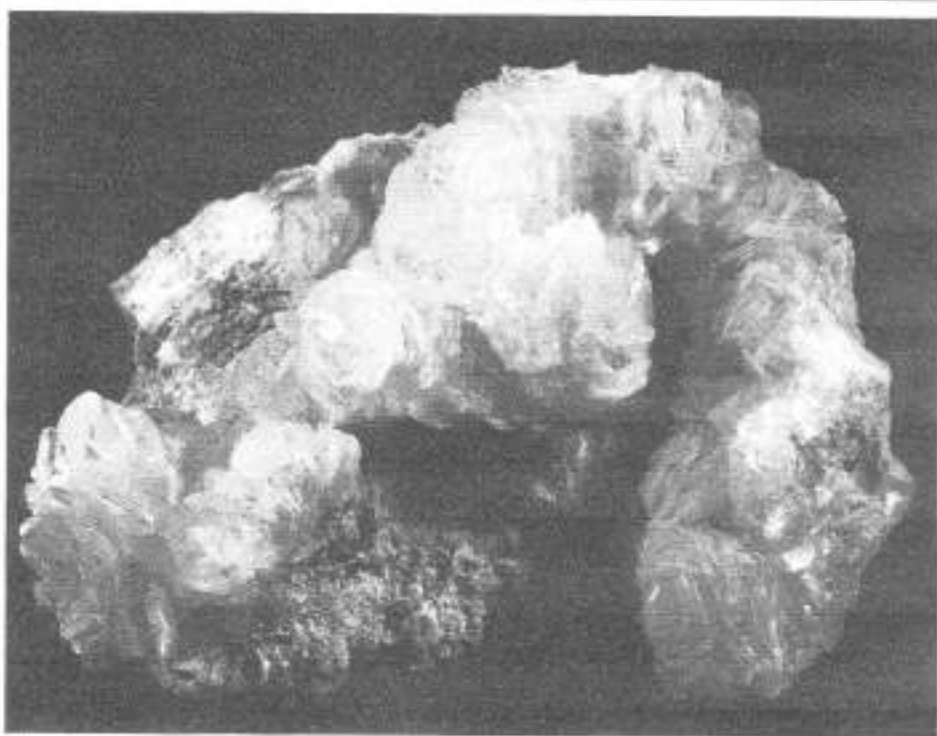


Figure 6. Crystallized brucite from the Wood Mine, 2 x 4." Specimen, Jay Lininger collection, photo by Ellis Wolfe.

1922,97)

There were two shafts, and mine depth reached 720 feet. In 1922 Knopf reported massive dumps, but the good ore had been well sorted out. The main ore body was unusu-

ally well-defined for a podiform chromite deposit. The mine had been flooded, dewatered, then later reflooded. It was probably the last of the chrome mines of this region to be dewatered in the twentieth century, as



Figure 7. View of the water-filled entrance to the Wood Mine, circa 1920. Photograph courtesy of the Philadelphia Mineralogical Society Archives.

late as the 1930's. In 1960 Pearre and Heyl summarized virtually all the good descriptions of this mine (see Fig. 6). The mine was a favorite of mineral collectors, and minerals found on the dump included brucite (see Fig. 7), deweyllite, magnesite, hydromagnesite, zaralite, genthite, olivine, possible uvarovite, clinocllore, antigorite, lavender fibrous chromian antigorite, deep-green serpentine, penninite, k ammererite, calcite, dolomite, and magnetite (Pearre & Heyl 1960,778). At that time they noted that most could still be found on the dump. In an article first published 1958, and reprinted in 1974, Lapham reported on the geologic setting, the petrography of country and ultrabasic rocks, and the paragenesis of the deposit at the Wood mine.

This article by Lapham about the chrome mines is somewhat incomplete. Among the omissions is mention of the Soldier's Delight area west of Baltimore which is a Natural Environment Area for the state of Mary-

land. Compared to the Wood and Reed mines, it was one of the most productive. Tyson and his sons owned and operated those mines also. There are open or filled shafts of five mines, and the remains of two concentrating mills. Traces of the dam that held the millpond and the millrace used to operate one of the mills are still visible. There are well-marked trails to two of the mines. There are no dumps as mapped by Pearre and Heyl (1960), and the inclined shaft of the Choate mine (see Figs 8 and 9), when not underwater, should not be entered because of rotten timbers and falling rock. Both an old inn where church services for the miners were held and the chapel that was subsequently built are in the neighborhood. This chapter of regional history left a lasting impact on the state (Newcomb 1987;1988).

Chromite and copper mining in Maryland virtually ended during the last decades of the nineteenth century. Mines were difficult to dewater,

in some the ore was exhausted, there was litigation over mining rights, mismanagement by the Tyson heirs, and the Civil War was disruptive. But most importantly larger supplies of the ore had been discovered elsewhere. While Tyson agents did not make the initial discoveries of chromite in California, they found more sources and Tyson quickly bought and/or mined those ores. It was more economical for him to ship ore from California to Baltimore by means of his transport network than to continue mining in Maryland. The chromite was then processed in Baltimore. Ore was also discovered in Turkey and numerous other places and shipped to Baltimore.

Copper

Location

Copper was mined in Maryland in a belt that went from Washington and Frederick counties in the west to Baltimore county in the east (Fig. 6). There were three districts, the



Figure 8. The weed-grown and weathered entrance to the Choate Mine at Soldier's Delight, circa 1920. Photo by E.M. Palmer, courtesy of the Natural History Society of Maryland.

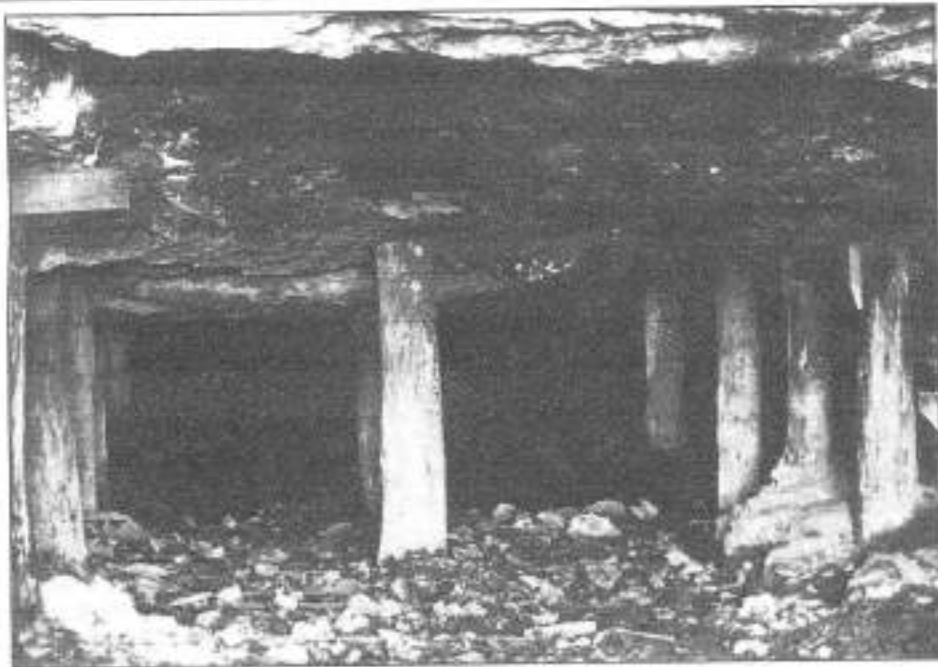


Figure 9. Interior of the Choate Mine showing timbers and water in the back-ground. Photo courtesy of the Natural History Society of Maryland.

Linganore farthest west, through Sykesville to Bare Hills north of Baltimore city. Copper mining and smelting had been done in Maryland before the Revolution, but Tyson was credited with reviving the industry. After 1835 he reopened the New London mine in the Linganore district, followed by the Liberty and Dolly Hyde mines in the same area. In 1849 Tyson opened the Springfield mine near Sykesville for iron, but chalcopryrite amounts increased with depth and copper ores became the main product (Heyl & Pearre 1965,53). In the same year, Tyson reopened the Mineral Hill mine in the same district. Tyson got the lease for the copper mine at Bare Hills in 1844. Mining continued sporadically in the Linganore district until the first decades of the twentieth century, but large copper deposits were found near Lake Superior in the 1840's, cutting profitability (Pearre 1964). I will discuss just two of the mines, one for its interest and accessibility, and the other because it has one of the few extant mine dumps where minerals can still be found.

Bare Hills

The Bare Hills copper mine was just across Falls Rd. from the chromite mining area. The only current record of its presence is Copper Mine Road.

In the 1970's a geology group using the old maps looked for the mine and found themselves on an asphalt parking lot. In 1964 Pearre wrote that while there is no mention of iron ore being produced there, magnetite was found on the dump (p. 18). Ore was discovered there about 1839, and in 1844 the lease was transferred to Tyson (Moore 1935,49). Moore's article was detailed and included maps of the area, the surface works, and the mine. The records are extensive, partially due to constant litigation about the mine lease. It was one of the few copper mines in Maryland that was successfully worked until almost the end of the nineteenth century. Tyson held the controlling interest until about 1855. The ore at Bare Hills consisted of chalcopryrite, bornite, and some primary chalcocite (Heyl & Pearre 1965,61). Heyl & Pearre also discuss the rocks of the district, mine history, and theories of ore origin with the expected mineral sequence.

Mineral Hill

Mineral Hill mine on the north side of Liberty Reservoir, just off Maryland Highway 32 is one of the few mines where there is still a mine dump to be explored. While part of the mine workings were flooded in the 1950's

with the advent of the dam downstream, there are still dumps above and below the dirt access road. This mine is in the Sykesville district, one of several copper mines in a band of ultramafic rock. Both mineralization and rock types and structure have been the subject of recent investigations of Piedmont geology (Wylie et al. 1987; Muller et al. 1989). This mine was opened before the American Revolution, closed when its owner returned to England, and reopened in 1849 by Tyson (Pearre 1964,15). In their 1965 publication, Heyl and Pearre included maps and descriptions of the workings (Fig. 11). Mineral Hill mine is an excellent place for students to study structure, do soil analysis, and identify minerals. In recent years my students have identified chalcopryrite, pyrite, magnetite, bornite, covellite, calcite, antigorite, malachite coatings, and examples of a typical banded iron formation (Newcomb 1988b,1). A student has shown examples of cuprite found nearby.

Environmental Legacy

We are now very concerned with the environmental implications caused by mining and manufacturing activity. Anyone who has read even a little history is aware that this is not a new problem. But as a society we are far more concerned about it now and, inadequate as some measures are for enforcement and cleanup, in the nineteenth century the problem was immeasurably worse. It is often thought of as a time when robber barons in oil, railroads, and mining, could circumvent laws by using their wealth and influence.

In that context it is interesting to note one legal arrangement made by Isaac Tyson, Jr., and his partner Evan T. Ellicott concerning a copper mining agreement in the Linganore district in 1839. In it they agreed to fill up holes and restore the grass and grain on land they mined, if the owner requested they do so, and Tyson and Ellicott allowed the owners to plant until the land was needed for mining (Md. Hist. Soc. Ms.863).

That was in great contrast to a de-

scription of the copperas works in Vermont that Tyson dealt with commercially and eventually directed for a period in the 1830's. After a description of the method employed to produce copperas from pyrites it was stated:

"The sulphurous acid produced had run down the side of the hill below, and killed the grass and leaves of the trees for several rods, as completely as though they had been scorched by fire. It was even dangerous to approach it except on the windward side. I thrust a stick into it and it was charred to blackness in a few minutes." (Locke 1821, 327)

Pure sulfur was deposited in some areas, iron rust coated most surfaces, and incredibly acid water ran into the streams after extraction of more copperas.

There has been a continuing impact on Baltimore harbor and the Chesapeake Bay from chemical manufacture and metal smelting. The sediments of the Bay generally show a high level of heavy metals, both in situ and in areas where harbor dredge spoil has been dumped. A number of studies have been done, one of which is titled "A pollution history of Chesapeake Bay," by E.D. Goldberg et al., in 1978.

The chrome chemicals operation passed to the Tyson heirs and to several chemical companies before being phased out in 1985. Early details of the operation are in the reference, Haynes, 1954. In 1992 a newsletter of the Sierra Club noted:

"Since 1845, chromium ore has been processed at the 19-acre site by numerous companies, ending in 1985 when Allied Signal (formerly Allied Chemical) closed the plant permanently. From the years of processing chromium and the result of non-existent environmental protections, the site now leaks 62 pounds of chromium into Baltimore harbor each day." (Harris 1992, 1)

In 1989 Allied made an agreement with the Environmental Protection Agency to clean up the site. This involves some removal, followed by encapsulation of the site, at a cost of millions of dollars. Discussion is continuing regarding any future use.

Conclusion

This article provides several answers to the question, "Why study history?" First, and foremost it is in-

teresting. Second, it explains how to find areas and remains that are part of a region's history, in this case, mining and mineralogy. Next, it explains regional development, the pace and location of settlement, and the development of transport networks and industrial history. And last, it provides insight into current problems concerning land use and the historical and future health of the Bay. An equally important conclusion is that early publications and maps are invaluable. In addition to the most current research, I hope our libraries can continue to preserve and recognize the importance of archival material, so we can use the past for the present.

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