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Cover Page Footnote

Earlier versions of this paper were presented at the Council for Northeast Historical Archaeology and the Historical Archaeology Conference of the Upper Midwest. Thanks to Tim Tumberg and Kelly Dixon for their help researching this paper and working through some of the ideas presented. The research described in the paper has been supported in part by Michigan Technological University and the USDA Forest Service, Ottawa National Forest. Thanks to Mark Hill of the Ottawa Forest for his support and help with direction of the project. Many other archaeologists helped guide the field work including Susan Martin, Pat Martin, Troy Ferone, and Jill Garrison Ferone. Thanks also to the numerous students and volunteers to the PIT projects who contributed their energy and made this work enjoyable. Finally, comments from two anonymous reviewers helped strengthen and clarify my presentation. Any mistakes of fact or interpretation remain my own.

Interpreting Social Organization at Industrial Sites: An Example from the Ohio Trap Rock Mine

David B. Landon

Historical archaeologists have frequently tried to interpret aspects of the social organization of production from artifacts at industrial sites. These studies have encompassed a variety of issues: the role of skilled immigrants, the effects of de-skilling work, and the ways workers resisted work discipline or used material culture to express their autonomy. Some recent studies portray the organization of production and the forces of industrialization as the overarching determinants of domestic assemblage patterning, while other studies emphasize factors such as household composition, household lifecycle, and the gender organization of labor. This paper reviews several studies of artifact assemblages from industrial sites, focusing in detail on the Ohio Trap Rock Mine Site. This review suggests both the promise and potential pitfalls of trying to use archaeological materials to understand the organization of industrial communities.

Les archéologues historiques ont souvent essayé d'interpréter des aspects de l'organisation sociale de la production à partir d'artefacts provenant de sites industriels. Ces études ont porté sur une variété de questions : le rôle des immigrants qualifiés, les effets du travail qui déqualifie et les façons dont les travailleurs ont résisté à la discipline du travail ou ont utilisé la culture matérielle pour exprimer leur autonomie. Certaines études récentes présentent l'organisation de la production et les forces de l'industrialisation comme étant les causes déterminantes de la nature de l'assemblage domestique tandis que d'autres études mettent en lumière des facteurs tels que la composition du ménage, le cycle de vie du ménage et l'organisation du travail en fonction du sexe. Cet article examine plusieurs études portant sur des assemblages d'artefacts provenant de sites industriels, dont en particulier et en détail celui de l'Ohio Trap Rock Mine. L'examen fait voir les avantages et les dangers qu'il y a à essayer d'utiliser le matériel archéologique pour comprendre l'organisation des communautés industrielles.

Introduction

One interesting debate currently running through historical archaeology is the extent to which meaningful aspects of people's lives are either distinct from, or determined by, the broader patterns of the social organization of economic production. In the past several years positions on both sides have been clearly presented. Leland Ferguson's *Uncommon Ground* (1992) could be taken to represent one extreme. He argues that the subculture developed by enslaved Africans on coastal plantations was strong enough that it constituted a resistance to, or even negation of, the economic and social power of the elite white planters. By ignoring European American culture in favor of their own culture, slaves "ignored and resisted the European American ideology that rationalized their enslavement" (Ferguson 1992: 120).

The other extreme position has been articulated by Orser (1996), in his critiques of the work of both Ferguson and recently Beaudry, Cook, and Mrozowski (1991). Orser's view is that inequality in social and economic power determines key aspects of the culture, and that the power of elites typically overwhelms the power of other members of the society. For example, in the Lowell textile factories, Orser views the interaction between factory workers and factory owners as "a shouting match that the owners won" (1996: 178). Thus in Orser's view one of our central interests in interpreting the social relations of production should be understanding and identifying manifestations of the elite's economic and social power.

Shackel (1996) applies such a perspective to his analysis of archaeological materials from

excavations in Harpers Ferry, West Virginia, the site of one of America's national armories. Shackel's focus is not the industrial work places, but workers' houses. His goal is to show how industrialization and changes in the organization of work at the armory altered domestic life. Shackel uses archaeological data from excavations at a master armorer's house and a worker's house, comparing material from the 1820s and 1830s to material from the 1840s and 1850s to look at changes that came with increased work discipline. This comparison includes evidence for yard vegetation, ceramics, food refuse, gun parts, and armory tools.

Shackel attributes virtually all the changes in the domestic assemblages to changes in the armory management and the action of industrialists, not to the actions of the workers who lived in the houses. For example, changes in vegetation around the houses are attributed to broad changes in the organization of the factory, and changes in lot use by the houses' occupants are not emphasized. The archaeological evidence suggests that maintenance and grooming to create a neat and orderly yard took place at the workers' house in the early 1840s, and that yard conditions deteriorated shortly afterwards. Shackel attributes this to the new military supervisors of 1841 taking a paternalistic interest in the workers' welfare and improving the yard conditions. He describes the subsequent yard deterioration as a result of industrialists no longer needing to justify the coexistence of the machine and the garden.

To give Shackel credit, an arms manufactory that is largely under government and military control is clearly a context in which the autonomy of the workers is constrained. His interpretation implicitly denies the workers any control of the landscape around their houses, however, and raises questions in my mind about the limits on worker autonomy. Did any of the workers renting the house have any control over the characteristics and use of space around the structure, or was this all the purview of the company? Shackel apparently sees this as the purview of the company, and argues that the workers' lives are patterned by

external changes, specifically industrial growth and the development of strict work discipline at the armory. Deliberately simplified, we could see Orser and Shackel as suggesting that the social aspects of workers' lives are determined entirely by the economic and social power of elites and the economic transformations elites helped create. We could simplify the opposite extreme position, and argue that the meaningful social aspects of workers' lives, even enslaved workers, are determined primarily through their daily interactions and within an individual power context where people live their everyday lives.

When presented in this deliberately simplified form, neither position seems satisfactory, and some combination of these views seems warranted. I believe we must create an image of the past in which active individuals made purposeful choices, even when broader social and economic forces constrained those choices. This parallels Mullins's idea that patterns of industrial change reflect local agency as well as the influences of industrial elites (1996: 156). The existence of powerful structural economic and social forces does not universally eliminate people's autonomy. Conversely, complete autonomy or freedom from control is not inherently part of individual choices or the development of a distinctive subculture. Our image of the past must also recognize the context-specific aspects of social power. Within some contexts individuals have greater power, while in others the constraints are greater. One of the challenges in archaeological interpretation is determining how material culture serves to negotiate these apparent contradictions.

We can connect this rather theoretical discussion back to potsherds by thinking again about the archaeology of households at industrial sites. We can recognize that broad characteristics of the economic system and the organization of production place external constraints on household decisions. At the same time, we can recognize that there are many internal aspects of households that structure their responses to the system of constraints, and structure their choice and use of material culture. The aspirations of the members of a family, a household's ethnic traditions, the composition of a household, kinship systems,

and conceptions of gender roles are but a few examples.

Brashler (1991) provides a good illustration of the effects of household composition and gender division of labor in the logging industry of highland West Virginia. Contrary to the mythic portrayal of the rugged lumberjack in all-male camps, it is clear that women and children were present in lumber communities. Further, the gender composition of households and settlements structured logging camps in specific ways, influencing both the archaeological assemblages from camps and the overall camp settlement system. The archaeological record of these settlements does tell about the corporate organization of work, but it also tells about the decisions families made during the transition from family farming to wage labor for lumber companies, and about the continuing importance of kinship systems in highland West Virginia.

Though Brashler provides a useful example, interpreting aspects of the social organization of production from archaeological materials is a fundamentally difficult task, and is not always possible. Starbuck's (1986) excavations at the isolated, late 18th-century New England Glassworks Site is a case in point. Excavation of three dwellings and the main factory building yielded a large artifact assemblage comprising both domestic and industrial materials. The three house assemblages had different proportions of local and imported ceramics, but most of the variation in the artifacts appeared to be a result of house size (Savulis 1986: 97). The artifact assemblage provides no clear indications whether women and children lived or worked at the site, and the size and composition of the individual households and overall workforce remains unclear. The ethnic composition of the workforce was not visible in the domestic artifact assemblage, but only in the German-style design of the glass furnace (Starbuck 1986: 79). Overall, archaeological data provided few definitive insights into even the most basic aspects of labor organization. A late 19th-century glassworks would be quite different, and aspects of labor organization might be much clearer. Nevertheless, these types of interpretations remain a challenge in studying industrial sites.

One unusual feature of Starbuck's glasswork's study is that he considers both the industrial and domestic components of the site. With a few exceptions (for example Hardesty 1988), this is rare. There appears to be a dichotomy between historical archaeologists' study of households and domestic artifacts and industrial archaeologists' study of workplaces and technology. In *Texture of Industry: An Archaeological View of the Industrialization of America*, Gordon and Malone (1994) make very little mention of archaeological studies of industrial households in an otherwise very broad-ranging account of numerous industrial communities. Historical archaeologists often take the reverse tack. For example, Mrozowski, Ziesing, and Beaudry's (1996) study of the Boott Mills boardinghouses explicitly focuses on details of daily life, meals, leisure time, clothing, and living conditions, with little direct connection to the routines of the workplace or the technology of the mills.

This division is fine, as long as the interpretive goals are appropriately linked to the archaeological context. Questions about changes in the work discipline should be linked to the archaeology of the workplace, while domestic assemblages inform interpretations of household-decision making and life-ways. When the emphasis shifts to more general questions about the nature of industrial communities, economic change, and the linkages between households and work, a consideration of both domestic and industrial material seems desirable. One example of how this might look is Thomas's (1992) historical portrait of the Welsh iron town of Merthyr Tydfil. Descriptions of the waste tips, factories, worker housing, noise, gas, and processes of work are blended together to paint a vivid picture of a past industrial community. Thoughtful attempts to close the gap between interests in privy pottery and steam engine design will mark a major advance in the creation of a holistic archaeology of industrialization.

The Ohio Trap Rock Mine Site

The potential difficulty involved in interpreting the social organization of production is also evident from my research on the Ohio

Figure 1. View of the Norwich Mine Settlement, ca. 1853. The Ohio Trap Rock Company settlement was located on the bluff top in the notch visible in the center of the print. (Illustration courtesy of Michigan Technological University Copper Country Archives.)

Trap Rock Mine Site in northern Michigan (Landon and Tumberg 1996). During the late 1840s and 1850s the Ohio Trap Rock was one of three mining companies digging copper out of the 410-ft (135 m) high Norwich bluff. The Ohio Trap Rock Company worked along the bluff top, while the other two companies worked along the base and face of the bluff (FIG. 1).

The copper veins the companies mined run parallel to the face of the bluff, continuing north and east to form a copper range through Michigan's Keweenaw Peninsula. This copper range contained large quantities of copper in a natural, metallic state, unalloyed with other elements. Douglas Houghton, Michigan's first geologist, wrote a report on the Keweenaw's copper deposits in 1841 (Krause 1993: 117–123), igniting a mining boom. The 1840s saw large-scale exploration and mineral speculation in the region, with the earliest copper ventures clustered at the north and south ends of the copper range. The Ohio Trap Rock was one of the early, failed mining attempts in the region. This company was the first Euroamer-

ican venture to mine the Norwich bluff, and was one of the first full-scale operations at the south end of the mineral range. Workers began exploring the site by 1846, and mining by 1848. By 1854, the company, under the direction of Cornish mining captain Joseph Buzzo, had built 22 houses, a church, a saw mill, a stamp mill, and a variety of other surface works (Ohio Trap Rock Mining Company 1855). Sixty-nine acres of land were planted with hay, corn, and oats for the domestic animals, and turnips and potatoes for the workers. Captain Buzzo and the other workers at the site apparently attempted to establish a self-sufficient community on the upper Michigan frontier. No illustrations of the Ohio Trap Rock settlement have been found, but it probably looked much like the contemporaneous Norwich mine settlement with small log miners' cabins, blacksmith shops, animal barns, and other industrial buildings interspersed among the stumps of newly cut trees (FIG. 1).

The company was headquartered in Pittsburgh, with the mine captain acting as the

company's site superintendent in Michigan. Company reports to stock holders in 1854 betray anxiety about the heavy expenditures on surface development (Ohio Trap Rock Mining Company 1855), and these concerns were apparently well founded. A lack of profitable copper deposits limited the Ohio Trap Rock's economic prospects, and the company was never a significant copper producer. By the mid-1850s the company was struggling. In 1857 or 1858 the mine closed permanently, having expended \$150,000 on a failed venture (Jamison 1950).

Trying to explicitly interpret the social organization of production helps us assess how aspects of the industrial order pervaded life in isolated industrial outposts. We could legitimately include a variety of interrelated topics under this broad focus: the responses of miners to the industrial work and new living conditions; the roles of ethnicity and different ethnic groups in the formation of the district; and household structure and labor organization. Many aspects of the social organization of the district are already known (see for example Krause 1993; Lankton 1991). Immigrant Germans, Irish, and especially skilled Cornish miners and surface workers played a great role in the founding of the district. After an initial exploratory period with all-male workforces, mining companies tried to attract married workers and their families, believing this would provide a more stable workforce. Workers apparently tried to resist the grossest forms of company domination through mobility strategies, either going to work for a competing mining company or leaving the mining district.

So, what can an archaeological case study contribute to our understanding of the social organization of production? At the Ohio Trap Rock Mine Site the domestic archaeological material tells most of the household structure and gender composition of the settlement, but says little about the work and nothing about the ethnicity of the workers. The archaeology of the industrial areas tells a lot about the technology and the skills of immigrant workers, and raises significant questions about gender roles and the industrial division of labor. The different insights provided by the industrial and domestic components of the site show the

importance of explicitly examining both housing and work places, an approach often lacking in historical archaeology. Finally, both the industrial and the domestic remains seem to tell as much about the decisions of the men and women who lived in the community as about the economic and social power of the distant companies that owned the mines.

Archaeological Research

Over the past several years the industrial archaeology program at Michigan Technological University and the Ottawa National Forest have been cooperatively researching the site. In addition to historical research the site has been mapped, two domestic structures have been test excavated, about ten acres have been systematically surface collected, and several industrial features of the site have been investigated (Dixon 1994; Greek 1993; Landon and Tumberg 1996).

The Ohio Trap Rock operations clustered in two adjoining valleys; a North-South valley with most of the industrial workings, and an East-West valley with most of the housing (FIG. 2). The domestic artifacts come from a surface collection that covered approximately ten acres along a historic trail running through the E-W valley. Surface artifacts were mapped in place with a transit and collected. The vast majority of the material collected was domestic, as opposed to industrial (TAB. 1). Architectural materials, such as window glass, nails, mortar, and door hardware, comprise the highest percentage of recovered artifacts. These materials are the physical remnants of the community's houses. Cast iron stove parts were scattered across the domestic area of the site, a testimony to the region's harsh winters.

It is interesting to compare the overall artifact pattern to artifact signatures developed from other mining sites. In looking at the roles of gender in mining communities in the West, Hardesty (1994) reviews Blee's (1991) study of how artifact assemblages reflect the sexual composition and function of households. Brothel and saloon assemblages were typically more than half liquor bottles, with relatively few food preparation items, and less than 1% decorated dishes. Assemblages from all-male households also had few food preparation

Figure 2. Map of the Ohio Trap Rock Mine and adjacent area (based on Martin 1985). Some of the shafts at the southern edge of the site most likely relate to the Norwich Company's operation.

Table 1. Functional classification of the artifact assemblage (based on Dixon 1994).

	<i>N</i>	%
Domestic	1067	42.2
Personal	23	0.9
Transport	1	0.0
Architecture	1098	43.5
Industry	133	5.3
Unknown	204	8.1
Total	2526	100.0

items, less than 1% decorated dishes, and were dominated by personal items. Assemblages from family occupied houses were typically more than 40% food preparation items, with more than 8% decorated dishes.

This assemblage from the Ohio Trap Rock contains material surface collected from multiple households, but an aggregate view is nonetheless informative. Most of the recognizable house outlines are uniformly small, though one larger structure might have functioned as a multi-family house or as a boardinghouse. Though the material attributable to individual structures was limited, there were no obvious differential concentrations of expensive or inexpensive wares with particular structures. The relatively small proportion of personal items in the assemblage runs counter to the all-male household pattern at mine sites in the West (TAB. 1). The artifacts lumped together as domestic are mostly glass and ceramic food storage and preparation items. Though liquor bottle forms are present, they are relatively few in number and far outnumbered by the ceramics. These characteristics all seem to represent family occupation of

the site. The presence of at least some women at the settlement is also reflected in a small number of women's clothing fasteners recovered in a test excavation at one of the houses.

The ceramic assemblage is dominated by relatively high-quality refined wares (TAB. 2). Whiteware and pearlware comprise more than 90% of the ceramic assemblage, and are the most widely distributed artifact related to food service. Utilitarian stonewares and earthenwares are present, but comprise a very small proportion of the ceramic assemblage. It is also interesting to note the variety of decorated ceramics in the assemblage (TAB. 3; FIGS. 3–5). This was evident during the surface collection, and is even more apparent when quantified. Almost 40% of the total sherds and fully 70% of the white-bodied earthenware vessels are decorated. Edge-decorated and transfer-printed vessels are most common, followed by handpainted and other decorations.

The range of vessel forms is also intriguing (TAB. 4). The ceramic assemblage includes saucers, plates, and teacups as the major vessel forms in the collection. Very few utilitarian or storage vessels are present. Relatively few of the plates are decorated, but decorated ceramic tea service components are scattered throughout the residential area. From the ceramic assemblage, it appears that each of these households ate from similar, common tablewares, but drank tea from fancier, decorated, individual tea sets (Dixon 1994). While some of the material goods, such as the stoves, were likely supplied by the company, many of the ceramics were likely brought by individual families. The general impression from the ceramics is not that of an all-male frontier

Table 2. Ware type frequencies (based on Dixon 1994).

<i>Ware</i>	<i>Sherds</i>	%	<i>Vessels</i>	%
Stoneware	2	0.4	2	2.5
Coarse Redware	9	1.9	1	1.2
Jackfield type	1	0.2	1	1.2
Coarse Yellowware	9	1.9	2	2.5
Rockingham type	1	0.2	1	1.2
Pearlware	162	34.8	42	51.9
Whiteware	281	60.4	32	39.5
Total	465	100.0	81	100.0

Figure 3. Edge-decorated earthenwares (after Dixon 1994, figure 4.11).

Table 3. Decorations on the white-bodied earthenwares (based on Dixon 1994).

Decoration	Vessels	%
Handpainted	8	10.8
Dipped	4	5.4
Shell-edge	14	18.9
Transfer print	12	16.2
Flow Blue	5	6.8
Sponged	5	6.8
Molded	4	5.4
Undecorated or Unknown	22	29.7
Total	74	100.0

camp with limited and utilitarian material culture, but that of a family settlement with high-quality household goods.

At an 1860s housing settlement of the Quincy mining company, Martin (1992) found a small number of sherds of Northern European folk pottery, a clear indication of the Scandinavian immigrants who occupied the houses. At the Ohio Trap Rock Site nothing in the domestic artifact assemblage, the pipes, ceramics, glass, and other finds, gives any

Table 4. Frequency of vessel forms (based on Dixon 1994).

Form	Vessels	%
Plate	19	23.5
Platter	5	6.2
Sauce boat	1	1.2
Pitcher	1	1.2
Pitcher or teapot	2	2.5
Teapot	4	4.9
Teacup	12	14.8
Saucer	25	30.9
Bowl	5	6.1
Pie plate	1	1.2
Crock	2	2.5
Jug	1	1.2
Unidentified	3	3.7
Total	81	100.0

clear indication of the ethnicity of any of the workers at the site. The mine captain Joseph Buzzo and chief machinist Elias Sweet were both Cornishmen, but whether they selectively engaged Cornish workers or employed an ethnically diverse workforce is not known. Interestingly, some details of the industrial features at the site parallel Cornish surface processing

Figure 4. Transfer-printed earthenwares (after Dixon 1994, figure 4.12). Top row, left to right: light blue; black; purple with blue, green, and magenta accents. Second row, left to right: light blue; dark blue with dark pink accents; blue; dark blue with green accents. Third row, left to right: purple with blue accents; dark blue; dark blue; blue. Fourth row, left to right: blue; blue; light blue.

Figure 5. Decorated earthenwares (after Dixon 1994, figure 4.13). Top: flow blue. Bottom: dipped vessels with banded decoration.

technology, reflecting the role of these skilled immigrant workers in the establishment of the district.

Industrial Workings

The stamp mill was the most important surface processing facility at the early Keweenaw copper mines (FIG. 6). Mill workers crushed and washed copper-rich rock to concentrate the copper. The stamps consisted of a series of wooden or iron pestles with iron shoes attached. A cam shaft driven by a steam engine raised and dropped the stamps into an iron trough filled with copper-rich rock and flowing water. Once the rock was stamped fine enough it flowed through grates on the sides of the stamp trough and into the washing system. Individual mills used different means of washing in the early days of the district, but all washing processes allowed the heavier copper to settle out and separate from the waste rock. In simple operations workers built inclined wooden trenches, "common buddles," on or in the ground. As the fine copper, rock, and water mixture

flowed through the trench the heavy copper settled out first, and the waste sand was deposited further down the trench.

Several excavation seasons centered on the Ohio Trap Rock's stamping and washing area (Landon and Tumberg 1996). The overlying sediment in this area of the site is stamp sand, an olive green coarse to very fine sand left from the stamping process. This sediment has enough residual copper content to act as a biocide, inhibiting the action of bacteria and fungus that would normally destroy buried organic materials. Organic preservation in the stamp sands is phenomenal. The buried wooden components of the structure are virtually pristine, while any part that was above ground is gone. Excavations exposed parts of the building sill, vertical siding, shingles, wooden flooring, and a hinged door, giving a good idea of the layout of the mill. We uncovered wooden components more directly related to the copper washing process, including a wooden crown gear that was part of the power transmission system, and wooden launder troughs for moving crushed copper and water through the washing opera-

Figure 6. Industrial surface works of the North American Mine, ca. 1849. The Ohio Trap Mine was similar, but had a more complex washing system for concentrating copper. The building at the front left is likely a blacksmith shop. The stamp mill is in the back left, illustrated with a horizontal engine boiler and large flywheel to power the stamps. The stamp battery is shown with a round horizontal cam to lift the vertical stems of the stamps. The men in the front of the mill are likely preparing to load copper sand from the in-ground trenches into the waiting barrels. The man pushing the cart along the elevated tramway is bringing copper-rich rock to be stamped in the mill. (Illustration from Foster and Whitney 1850.)

tion. Excavations also revealed the bases of two jigs where coarse stamp sand was agitated and screened to concentrate the copper.

One of the interesting aspects of the jigs is that some historic Cornish representations show them being run by women. James Henderson, describing Cornish ore dressing practices in 1858, illustrates women operating jigs and crushing ore by hand with hammers (FIG. 7). Historical sources on Cornish mining practices make it clear that in Cornwall, women frequently worked on the surface as ore dressers, sorting mine rock and running parts of the washing operation. A reformer writing about the Cornish "bal maidens" in the late 1850s provides a clear account.

The "maidens" are usually sent to the mines at the early age of from six to seven years, where they are taught to assort the ores, after which they learn to buck and jig them—that is, bruise and separate by

water the ores of copper, lead, and zinc; a most laborious species of work.... (Burt 1972: 119–120)

It is possible that women operated the Ohio Trap Rock's jigs or worked in other parts of the ore dressing operation, but it remains an open question. There are no historical accounts of female surface workers in the Keweenaw copper district, even though labor practices in the district have been intensively studied (Lankton 1991; Lankton and Hyde 1982). Women's work in Cornwall apparently became boy's work in Michigan. Given the importance of Cornish mining traditions, and the early arrival of Cornish miners with their families, it remains unclear why the tradition of the so-called "bal maidens" did not transfer to the Keweenaw copper district. This is an intriguing question that connects gender, ethnicity, and the physical organization of pro-

Figure 7. A Cornish woman "cobbling," or breaking mine rock by hand to recover ore-rich pieces. (Illustration from Henderson 1858.)

duction. It also points out an important limitation of archaeological data. Linking complex industrial features to specific work tasks is already a challenge, one made more complex by age, gender, or ethnic divisions of labor. In the absence of detailed descriptions of work practices, it remains unclear how we could identify material correlates of gender-specific jobs or a gender division of labor at an industrial site.

This is particularly vexing because of the excellent evidence for Cornish surface processing technology at the site. One of the central features of the washing process at the Ohio Trap Rock is a distinctly Cornish-style, circular, convex, center-head buddle, two of which have been partially excavated (Landon and Tumberg 1996). Circular buddles were one of the last steps in the washing process, designed to catch fine particles of metal (FIG. 8). The finely crushed copper rock and water, "slime," flowed down a launder over the center-head and onto the top of the convex

floor of the buddle. Revolving brushes swept the surface of the slime on the buddle floor, helping to spread the slime. As the slime spread over the floor it moved more slowly, and particles in it dropped out and began to build up into a layer of mineral. The heaviest particles, with the highest concentration of copper, fell near the center, and the lightest, with the lowest concentration of copper, flowed out toward the periphery.

From historical descriptions of ore-dressing practices (for example, Henderson 1858) it is clear that this was a Cornish technology, brought to Ohio Trap Rock by immigrant Cornish workers. In addition to Captain Buzzo, the mine's machinist, Elias Sweet, was also an immigrant from Cornwall, and it is likely that Buzzo hired other Cornishmen. These workers built two round buddles at the Ohio Trap Rock between 1852 and 1855, presumably under Sweet's direction. At this time round buddles were just starting to gain widespread recognition and use in Cornwall. Because of the skills of these immigrant workers the Ohio Trap Rock mine was, for a brief period, employing the latest ore-processing technology. The buddles and the other surface developments represent a serious investment of time, money, and effort, yet they were only used for a few years before the company shut down.

In some ways we can interpret this site as a reflection of the structural power of the company's owners and investors, who expended a significant amount of money and effort trying to establish a monetarily successful and producing mine. They made many of the basic decisions about the location, equipment, and nature of the settlement. The explosive growth of the mining district, with its explicit focus on resource extraction, was inherently a function of the expanding system of industrial capitalism. The growing scale and reach of this industrial system is clearly reflected in large-scale movement of immigrant miners and surface workers into newly established frontier mining districts, bringing with them the mass-produced goods of the burgeoning factories.

At the same time it is worth contemplating how the archaeological record of technologi-

Figure 8. Elevation of a Cornish buddle. Water and copper-rich sand flowed down the wooden launder at right, washing out over the buddle floor. The gearing visible at the center top is the drive mechanism for the sweeps that worked the floor. The examples from the Ohio Trap Rock Mine are similar, but constructed entirely of wood, including wooden gearing. (Illustration from Henderson 1858.)

cally sophisticated Cornish washing buddles and fancy teawares can be reconciled with our image of a frontier mining settlement that spent all of the investors' money, never made a profit, and went under in less than ten years. Why did the mining families bring their decorated teawares out to a settlement of log mining cabins? Why did the workers at this location choose to construct so much housing, plant fields, build a church, and invest so much time and effort in constructing the industrial surface works? To answer these questions we must consider not just the power of the company management, but the actions of the workers. The physical distance from the company owners and the local decision-making power of Captain Buzzo likely helped create a context in which the workers had a great degree of personal and community power. The site settlers apparently did not anticipate the mine's failure, but instead planned for a long-term success. Coming from a well established mining district with a long history, Cornish immigrants' conception of "long term" included specific alterations of the landscape designed to create a permanent settlement along the lines of what they had known. They over-built the surface works by trying to establish the processing system of the most progressive mines in Cornwall. Simi-

larly, they spent the company's money on surface developments that were auxiliary to the main mining operation but created a more settled environment: agricultural fields, a church, and extensive housing. While this interpretation does not answer all of the possible questions about the site, it does help us connect aspects of home and work life to the cultural traditions and decisions of the individuals who settled and worked the Ohio Trap Rock mine.

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