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Last Gap: The Construction, Operation, and Dissolution of the Adirondack Iron and Steel Company’s “New Furnace”

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Introduction

Adirondack Iron & Steel Company’s “New Furnace” is arguably the best-preserved example of a mid-19th-century ironworks. At first viewing, the dark, massive, masonry blast furnace appears compact, situated along the shoulder of the forested road. Its crisp, clean corners trace straight lines from its base to the top of the stack (fig. 1). Further investigation reveals other components positioned about the landscape in ruin, yet, still providing clear illustration of a complex industrial operation.

Broader systematic surveys of this National Register District documented physical remains associated with this antebellum plantation-style ironworks known as Upper Works, McIntyre, and Adirondac (Youngken 1977; Historic American Engineering Record [HAER] 1978; Seely 1978; Staley 2004). The development is exemplary of the larger, dynamic, charcoal-iron industry that adopted technologies from anthracite smelting during a period of rapid technological change (Seely 1981: 27–54). The New Furnace represents the last structure in a series of forges, cupola furnaces, blast furnaces, dams, charcoal kilns, and other facilities constructed at Upper Works, and the company’s “last gasp” prior to failure (Seely 1981: 134).

Nestled in the mountainous High Peak Region of the Adirondack Mountains, the Upper Works are 16 mi. from the nearest hamlet, Newcomb, New York (fig. 2). This isolation, related transportation costs, and difficulties inherent in the smelting of titaniferous iron ores have been cited as the major reasons for the ironworks ultimate failure. Likewise, isolation has been cited as a primary reason for the preservation of both the works and the New Furnace, largely sparing the machinery and masonry at the sites from historical salvage (Seely 1978, 1981; Null 2009). Preservation at New Furnace can also be credited to the use of quality materials, craftsmanship, and design.

1. There are numerous contemporary blast-furnace stacks in the Northeast, such as the Wharton, Rockland, and Victory furnaces in Pennsylvania (White 1986), Oxford Furnace in New Jersey (Historic American Building Survey [HABS] 1935), and the Nassawango Furnace in Maryland (Heite 1974: 31; HAER 1989). However, unlike many of these sites, Upper Works has not been extensively reconstructed, and the district includes multiple smelting facilities, each associated with ancillary features and artifacts that, together, represent evolving technologies.
elements, such as the parallel and diagonal iron binders used in its construction (Null 2009: 54). Visible testaments to craftsmanship include the precisely dressed anorthosite blocks forming the corners of the stack and the patterning in the brick arches (Seely 1978: 141; Null 2009: 51). Blast furnaces are subjected to extreme temperatures, temperature differentials between the interior and exterior while “in blast,” and temperature shifts beginning and ending each blast session or “campaign.” New Furnace was in blast for only two campaigns, spanning around a year (Seely 1978: 148–150). The brevity of use at New Furnace and the limited heating and cooling cycles contributed to its excellent state of preservation. Lastly, after abandonment, property ownership and stewardship regulated negative impacts to the district and this site (Staley [2016]).

Historical circumstances and the geographic setting preserved the architectural integrity and the industrial context at Upper Works. It was anticipated that the hard shell of the New Furnace would protect associated archaeological deposits. Historian Arthur Masten suggested that work at the furnace “was dropped just as it was” (Masten 1923; Manchester 2010a: 125). His next statement was placed in quotes, but
unattributed: “The last cast from the furnace was still in the sand and the tools were left leaning against the walls of the cast house.” The temptation to be lured into a “Pompeii premise” (Binford 1981, Schiffer 1985) was tempered by knowledge of mining and smelting operations, and results from previous archaeological investigations of 19th-century blast furnaces.

In general, mining sites are subjected to cycles of occupation, extraction, and abandonment that “mutilate” all or portions of earlier, mining-site structure (Hardesty 1988: 12, 1990: 48). New Furnace and much of the Upper Works district avoided total destruction by being located outside the footprint of the larger 20th-century titanium development farther south. The daily operations in the working arch and casting house of a blast furnace repeatedly wipe clean the archaeological slate through removal of product and waste-product and the reuse of mold materials. Given the inherent dangers in this workplace environment, furnace masters would likely recognize the value of, and demand, a clean and tidy workspace. Subsequent to abandonment, the works became a destination, with the New Furnace as a central curiosity. The paucity of tools and artifacts directly associated with smelting, combined with the numerically overwhelming array of remains associated with the post-abandonment visitation, lead to the Masten’s conclusion that “Pompeian” New Furnace had, in actuality, been picked over by late 19th-century visitors (Staley [2016]). In the absence of an assemblage of smelting implements, the use of more mundane, pedestrian artifact categories, such as building materials, smelting raw materials, and waste products, is more central to this analysis. Since the site was not particularly attractive to visitors collecting curios, analyses of these mundane artifact categories might provide an unbiased record of behavioral patterns and postdepositional processes.

Nearly all 19th-century ironworks documented during regional surveys are in a state of substantial to total collapse (White 1986; Allan et al. 1990; Rolando 1992). Previous archaeological excavations of 19th-century furnaces and ironworkings have often found evidence of demolition, reconstruction, large-scale material salvage, and adaptive reuse, such as at Carp River, Michigan (Landon et al. 2001), the Eaton Furnace in Ohio (White 1980, 1996), the West Point Foundry, New York (Kotlensky 2009), and Bluff Furnace in Tennessee (Council, Honerkamp, and Will 1992). The degree to which these behaviors impacted the archaeological record and interpretive potential varies. All the excavations provided insights into site structure and organizational layout, with some identifying stratigraphic levels pertaining to the initial construction (Kotlensky 2009: 68). Functional or operational deposits containing casting sand, cast-iron fragments, and slag deposits are common, yet, examples...

Archaeologists from the Cultural Resource Survey Program (CRSP) of the New York State Museum conducted excavations at the furnace prior to proposed stabilization work sponsored by the Open Space Institute and the New York State Department of Environmental Conservation (Staley 2006; Null 2009). The purpose of these excavations was to gather information about the location and character of significant deposits so that site impacts could be avoided. Although far from the imagined Pompeian blast-furnace deposit, the well-preserved, intact structural, stratigraphic, and artifactual remains, found adjacent to the furnace and under its arches, depict aspects of furnace construction, a year of operations, post-operational visitation, and structural decay. Data analysis and interpretation of post-abandonment visitation can be found in Staley ([2016]). This article focuses on construction, use, and structural decay at New Furnace. In addition, artifact patterning in a construction-related stratum may reflect an aspect of capitalist ideology: corporate paternalism. Subsequent sections of this article will further develop the general contexts of 19th-century blast-furnace technology, capitalism, and corporate paternalism, and then, more specifically, the contextual history of the Adirondack Iron & Steel Company’s Upper Works and the construction of the New Furnace. Archaeological results are described, followed by a discussion and conclusions.

Iron-Smelting and Blast-Furnace Technology in the Mid-19th Century

The iron-smelting industry was undergoing dramatic changes during this period. The following summarizes those changes and characterizes the adaptations made by the charcoal-iron industry. New Furnace and the Upper Works of the Adirondack Iron & Steel Company are representative of contemporary charcoal ironworks responding to the developments within the anthracite-fueled industry (Seely 1981).

The traditional charcoal-iron plantation of the early 19th century was located near wood and ore resources, and near water suitable for generating power. Such locations were often remote and required the development of a related community. Traditional furnaces were short and squat, and their “boshes” resembled two cones positioned base to base. Blowing machinery included leather bellows and, later, vertical blowing tubs. Waterwheels drove a pair of single-acting pistons pushing air into wooden boxes that served as a reservoir and smoothed air delivery. Colliers made a soft version of charcoal in covered pits. Furnaces were typically made of stone, hearths lined with refractory sandstone or brick, and the stacks were open topped with wooden charging bridges connecting with the tops. The development at Upper Works shares many of these basic attributes with earlier and contemporary ironworks.

The successful use of anthracite coal in Pennsylvania’s Catasauqua Furnace and other Lehigh Valley blast furnaces in 1840 brought a number of changes in the iron industry (Seely 1981). Most notably, blast-furnace sizes increased and bosh shapes elongated and widened at the hearth. The increased stack sizes required a system of rods and bands for reinforcement. Blowing machinery improved to provide greater volumes and more consistent airflow. Hot blast was introduced to coal furnaces to maintain higher temperatures required by that fuel (Belford 2012). New machinery was developed to make and deliver hot blast, and numerous secondary modifications were required by the technology. This includes heavier materials used for air conduits and water-cooled air nozzles or tuyeres, dam and tympp plates. Because of the higher temperatures produced, hearth openings around the blast pipes were filled with masonry. This, in turn, required the development of viewing ports and pokers through the blast pipe. The use of anthracite coal as fuel, along with the greater furnace sizes, hot blast, and improved blowing machinery, made iron smelting dramatically more fuel efficient and produced iron faster (Belford 2012: 33). The adoption of kilns by the charcoal-making industry increased the relative strength of that material and allowed many of these innovations to be adopted by the charcoal-iron industry (Seely 1981: 36; Kotlensky 2009: 55).

The Adirondack Iron & Steel Company aggressively adopted many of these new innovations crowning its efforts at New
Furnace. It built a small complex of charcoal kilns near its first blast furnace. The original blast furnace was 20 ft. in height. It was modified to be 30 or 35 ft. tall with a bosh 7 ft. in diameter, approximating the industry average for contemporary facilities (Seely 1981: 35). The 1844 furnace also included hot blast, as provided by a ground stove. This stove was soon replaced by a stove placed on the stack, with air heated by furnace exhaust. New Furnace construction also included innovations, such as a larger 45 ft. stack, a modified bosh shape with an almost 12 ft. diameter, double-acting horizontal cylinders as the core of the blowing machinery, and a Neilson-type hot-blast stove on the stack. The builders incorporated the iron-reinforcement system, but added extra diagonal or octagonal braces. Hearth openings around the nozzles were filled. Heavy-gauge sheet metals carried cool, compressed air to the stack, and a cast-iron pipe (a “downcomer”) brought heated air down to each of the three nozzles. The company installed water-cooled tuyeres, dam, and tymp plates. The blast pipes featured viewing ports and built-in pokers.

Many of these modifications and materials were shared by other charcoal ironworks of the mid-19th century. Various treatises on iron, such as Mushet (1840) and Overman (1850), describe furnaces and components in detail, and these works guided industry construction. Seely (1981: 36) found that 73 of 326, or 22% of furnaces built after 1840 were greater than 40 ft. in height (Seely 1981: 36; Council, Honerkamp, and Will 1992: 163), suggesting New Furnace was fairly representative. New Furnace’s shape and 45 ft. height matched that of the Catsauqua Furnace, perhaps linking New Furnace with the anthracite fuel works. Hot blast was documented at 271 of 711, or 38% of New York, New Jersey, Pennsylvania, and Ohio charcoal furnaces in 1859 (Seely 1981: 47, 50; Council, Honerkamp, and Will 1992: 163). Specifically, charcoal kilns, larger furnace sizes, Neilson-type hot-blast stoves, and improved blowing machinery were documented at the Sisco Furnace in Westport, New York, the Crown Point Iron Company on Lake Champlain, and the Fletcherville Furnace (Seely 1981: 50). The Oxford Furnace in New Jersey and the Nassawango Furnace in Maryland also used hot blast derived from exhaust gasses (Belford 2012: 34) and included iron reinforcements or bracing (HABS 1935; HAER 1989). The 1844 furnace at Upper Works, the West Point Foundry, and probably numerous others used sandstone from the same Haverstraw, New York, quarry (Seely 1978; Kotlensky 2009). The New Furnace used more-locally quarried sandstone.

**Capitalism and Corporate Paternalism**

The primary thrust of this article presents aspects of the construction, use, and decay of a 19th-century blast furnace, as revealed through archaeology. A peculiar size-sorting pattern was revealed in one of the construction strata, representing an intentional transformation of a primary deposit (Schiffer 1987). Contextual archaeology is used to link the observed archaeological pattern to a particular instance of corporate paternalism. The development of interpretive links and leaps between artifact or pattern and cultural process are a persistent challenge to archaeology (Wylie 1999; King 2006: 305), and poorly developed or non-transparent linking arguments have met derision and critique (Scarlett and Sweitz 2012: 129–130). Capitalism and paternalism are broad subjects that have been the focus of theorists and have been explored through historical archaeology, creating an expansive literature. The following provides a brief theoretical context that is balanced with the limited excavation scope, focus, and results.

Corporate paternalism might be seen as a style of management or ideology associated with industrial capitalism (Metheny 2007: 5). Capitalism is generally defined as an economic system based on a set of social relations characterized by private ownership of resources and commodification of labor (Leone 1999: 4–7; Leone and Knauf 2015: 6), but is also simultaneously a social system, mode of life, and an ideology (Matthews 2010: 9). Historical archaeology and the study of material culture is well suited to the study of capitalism and the social categories of race, class, and gender (Leone and Potter 1999; Mrozowski, Delle, and Paynter 2000: xiv; Matthews, Leone, and Jordan 2002; Matthews 2010: 1). Many approaches to capitalism have been framed within a Marxist perspective, which tend to become simplistically reduced to binary oppositions of wealth holders and wealth producers, and
dominance and resistance (McGuire and Paynter 1991; Leone and Potter 1999). Other studies are more nuanced, approaching the subject from a variety of perspectives and presenting the power struggles within capitalism as variable negotiated points along a continuum (Metheny 2007; Cowie 2011).

Corporate paternalism is a common theme in the history of 19th-century industrialism. The practice of corporate paternalism was central to the development and operations of company towns, as well as the workplace. Paternalism is a management style in which employer/employee social relations are built on the idea of patriarchal authority, with the associated reciprocal obligations (Jackman 1994: 9–11; Metheny 2007: 5–11). One style of industrial or corporate paternalism in the United States is exemplified by the Waltham-style textile industry of Lowell, Massachusetts (Beaudry 1989; Beaudry, Cook, and Mrozowski 1991; Mrozowski, Ziesing, and Beaudry 1996; Green 2010: 17–22). This formal style was highly structured, heavily capitalized, and featured impersonal relationships between owners and workers. Working and living environments were highly controlled. Through the 19th century a number of industries adopted and modified the form, including the iron industry and, specifically, the Adirondack Iron & Steel Company at Upper Works. Paternalism is an ideological system riddled with contradictions rising from a tensive intermixture of “dominance/malevolence with altruism/benevolence” (Jackman 1994: 11–14). Motivations for paternalism are found somewhere along that continuum, and company towns established by corporations take shape guided by those motivations (Cowie 2011: 15; Green 2010).

Paternalism is often linked to extractive industries, such as mining (Reid 1985; Shackel 2004; Metheny 2007; Hartnell 2009; Cowie 2011; Ford 2011). As a company town, Upper Works represents a case history of industrial paternalism, as company management endeavored to create a complete community. Beyond the provision of the barest necessities for their operations and workforce, it built a number of facilities in support of health, education, and social services. Similar to paternalism instituted elsewhere, the management was motivated by a combination of religious ideology, commitment to social reform, labor management, and economics. McIntyre and his partners wanted their company town to have organized religion, schools for children with night classes for adults, a community library, medical care, and other services typical of small towns of the time (Seely 1981: 80–81, 126, 163). They hoped to attract and hold a stable workforce comprised largely of settled, married men (Ralph 1851). This workforce cohort was desired by many mining and smelting industrialists around the world, such as those at the West Point Foundry (Reid 1985: 583; Hartnell 2009: 98). The underlying motivation for favoring the married man is illustrative of the “tensive intermixture” mentioned above. On the one hand, family men would be less mobile, logistically constrained by their dependents, and ultimately more easily dominated by their employers. Yet, many of the industrialists were Protestants who valued strong families, hard work, self-improvement, punctuality, and sobriety. Like other paternalistic mining companies, Adirondack Iron & Steel expected a high level of industrial discipline and consistently imposed temperance rules (Seely 1981: 126; Reid 1985: 583; Van Bueren 2002; Metheny 2007; Hartnell 2009; Cowie 2011; Ford 2011).

Archaeological investigations have found reflections of industrial paternalism in settlement patterns, community structure, and housing (Hardesty 1998; Metheny 2007; Hartnell 2009; Ford 2011). Resistance to paternalistic controls or capitalistic domination has been interpreted from evidence of alcohol consumption in communities where that activity had been prohibited (Beaudry, Cook, and Mrozowski 1991; Van Bueren 2002; Shackel 2004) and from sabotage in the workplace (Nassaney and Abel 1993, 2000). Notably, most of the evidence for paternalism and resistance to paternalism has been found in community and domestic settings, rather than in the workplace.

A Brief History of the Adirondack Iron & Steel Company’s Upper Works

A detailed history of the Adirondack Iron & Steel Company and the Upper Works was compiled from primary archival sources as part of the Historic American Engineering Record (HAER) (Seely 1978). In addition to this comprehensive work, earlier works written by Hochschild (1962) and Masten (1935, 1968), and reports by Haynes (2010)
form the core of published information for this site. Many of these sources and others have been compiled and annotated in anthologies (Manchester 2010a, 2010b). The archives of the Adirondack Museum at Blue Mountain Lake, New York, hold company records and principal correspondence. As a foundation to the HAER work, the Adirondack Museum fielded teams that investigated the ruins in the vicinity, the result being an excellent set of maps detailing building locations, ruins, and historical refuse scatters (Youngken 1977). These sources provide the basis for the following abbreviated, contextual company history, as well as some of the specifics regarding the construction and use of this furnace.

In 1826, ore deposits near the source of the Hudson River were brought to the attention of the company principals. The partnership included Duncan McMartin, Archibald McIntyre, and David Henderson. McIntyre was the primary partner and financier of this prospect. Formerly a state legislator and state comptroller, he also held interests in several other businesses and industries. McMartin, brother-in-law to McIntyre, was a former state assemblyman, state senator, and judge. He directly supervised the initial construction at the works. After his death in 1837, he was succeeded by McIntyre’s nephew, Archibald Robertson. David Henderson, McIntyre’s son-in-law, was a successful New Jersey businessman. One of his ventures was the first successful commercial pottery in the country (Barber 1909: 119–125; Mitnick 2005: 74). Henderson was considered the driving force behind the operation and of the main partners spent the most time at the works. The three men had previously partnered in other ventures, including a woolen mill, a multistate lottery, and a small bloomery ironworks in North Elba. The partnership for this venture eventually incorporated into the Adirondack Iron & Steel Company in 1839 (Hochschild 1962; Seely 1978).

Initial efforts by the partners were restricted to land acquisition and lobbying for a state road. Site development was limited to clearing several acres near the ore beds in 1830 (Hochschild 1962; Seely 1978; Haynes 2010). Two years later, ironworks development began in earnest with the construction of a forge, coalhouse, sawmill, a two-story log house, blacksmith shop, and stables (Hochschild 1962). McMartin initially named the place McIntyre, but in the early 1840s the ironworks and community were renamed Adirondac.

Due to limited transportation systems and concomitant costs, this ironwork, like most other 19th-century American ironworks, was located near the source of iron and charcoal. The isolation and remote setting required the company to provide all necessities, such as food and housing, in what is called a plantation-style development (Seely 1978, 1981: 28–29; Pollard and Klaus 2004: 24). Beyond the simple, pragmatic economic needs, the corporation fully embraced the ideology of corporate paternalism. McIntyre had also invested in a textile business, and he had followed the successful developments in Lowell (Seely 1978: 81). As the industrial infrastructure and the requisite labor force grew, so did the domestic, agricultural, and civic infrastructure. The village eventually grew to include a church, school, boardinghouse, 25 dwellings, bank, post office, carpenter shop, blacksmith shop, sawmill, gristmill, icehouse, and a powerhouse. Contributing toward self-sufficiency, the company maintained two farms that produced barley, hay, potatoes, sheep, and cattle (Seely 1978, 1981). By 1855 the industrial infrastructure at the works had expanded to include dams, flumes, waterwheels, a variety of smaller forges and furnaces, larger blast furnaces, charcoal kilns, ore roasters, magnetic separators, and stamp mills. The owners also incorporated a railroad company and built several miles of wooden track (Seely 1978; Haynes 2010).

Throughout this quarter-century effort, ownership enthusiasm and the pace of development repeatedly waxed and waned based on inconsistent smelting results, difficulties associated with transportation, and broader economic conditions. The company eventually shifted its focus to selling the property. One of the last development efforts was a second blast stack, the larger, state-of-the-art “New Furnace.” Construction began in 1849 and concluded in 1854 for a total cost of $43,000. The furnace operated over two campaigns, with its final blast sometime after June 1855 (Seely 1978: 134, 148–149).

The furnace sat dormant during 1856, with the company records showing no expenditures at the works. A national economic panic in 2. Using a formula incorporating unskilled wages, this would equate to approximately $9.61 million today (Williamson 2015).
1857 diminished the company’s hopes to sell the property, and those hopes were further dashed by a flood that washed out one or more of the dams in that same year (Hochschild 1962; Seely 1978; Manchester 2010a). Robert Hunter, former brickmaker at the works, was then hired as caretaker of the property. He and his family continued to use the farm and presided over the former ironworks while the primary business shifted to logging (Lossing 1866; Burroughs 1899; Masten 1935; Seely 1978). The property became a popular destination for sportsmen and travelers during the late 19th century, evolving into a series of outdoor sporting clubs. Club members occupied the village until 1947 (Stoddard 1874; Masten 1935, 1968; Haynes 2010).

Mineral interests in the valley were somewhat revitalized in the early 1890s, when James MacNaughton, a grandson of McIntyre, employed the French metallurgist Augusta Rossi. Rossi visited the works in 1892 and conducted experiments on the ores. His work demonstrated the potential utility of these titaniferous ores. The Adirondack Iron & Steel Company was reorganized as the McIntyre Iron Company in 1894, and the property was sold in 1906 to the Tahawus Iron Company. This company conducted extensive explorations and core drilling between 1906 and 1909, followed by temporary mining of ore between 1912 and 1914 (Seely 1978: 165–166; Haynes 2010). The property was sold to the National Lead Company (later N. L. Industries) in 1941. By 1945, the mining community at Tahawus, located south of the Upper Works, had 300 occupants, 84 houses, 2 apartment buildings, a restaurant, recreation center, store, and movie hall. After 1947, the mine needed additional houses for its workers and, with the lapse of the Tahawus Club (Upper Works Club) lease, the National Lead Company moved employee families into the housing until 1964. The McIntyre mine ceased mining in 1982 and closed operations in 1989.

**New Furnace Construction and Operations**

By 1848, against the backdrop of fluctuating enthusiasm for this investment and the overall theme of frugality, the owners had considered the idea of building a newer, bigger, more efficient blast furnace. Neither the timing of their decision nor their motives and intentions are explicitly stated in the records. Despite the fuel efficiencies and greater iron production at the enlarged original blast furnace, the company continued to have smelting problems. They were also concerned that their New Jersey steelworks would have an adequate iron supply. The firm had recently improved its water-power management through the construction of dams and diversions. Lastly, in addition to the above, the desire on the part of the principals for new facilities rather than old may all have played a role in the decision to build the new furnace (Seely 1978: 120–122). Nearly coincidental with the construction decisions were enormous, unrelated capital outlays. These economic pressures correlate with freshly stated desires to sell the ironworks, and the belief that a new, efficient blast furnace would attract potential buyers (Seely 1978: 109–112).

In Seely’s (1978) exhaustive document search, no single individual was identified as the designer, architect, general contractor, or lead builder for this project. Like many of the various developments and operations at the works, the principals likely provided written directives coupled with periodic onsite visits. Andrew Porteous acted as works manager or superintendent until 1851, when replaced by his former clerk, Alexander Ralph (Seely 1978: 112). A significant decrease in iron production after 1848 (Seely 1978: 108) might suggest Porteous had diverted his attentions from smelting operations to the planning, layout, and design of the New Furnace. Certainly, the superintendents of the works would have had some day-to-day control over construction. Many of the design elements and mechanical components used suggest the builders followed the Mushet (1840) and Overman (1850) treatises and shared design ideas and, perhaps, craftsmen with other ironworks in the region. Seely (1978: 139–141) duly afforded considerable credit to the masons and millwrights who labored on this structure. The company had employed Hiram Gibbs as mason from at least 1845 (Arthur H. Masten Papers 1845, 1846). Duplicate census records were contradictory, indicating Gibbs was 29 or 30 years old in 1850 and had Canada or New York origins (United States Bureau of the Census [USBC] 1850). Apparently, Gibbs and some anonymous masons were brought back to complete the stack lining in 1852 (Ralph
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1852). E. S. Adjutant, John Droit, and Alonzo Ridir were listed as carpenters at the works in 1850. Adjutant was the eldest of the three and claimed the greatest value of property (USBC 1850), suggesting he was the lead carpenter. In all likelihood, the man with the greatest influence over the design and layout of the New Furnace was the millwright Daniel Taylor. Taylor’s reputation impressed company principals when they initially consulted him in 1843 regarding the development of the first blast furnace at Upper Works (McIntyre Family Papers 1843). He was soon hired away from Crown Point business concerns to build all the power and blowing apparatuses associated with the first blast. In 1847, Taylor was in charge of the construction of the dam at Lower Works (Seely 1978: 50, 52, 58, 84). A Vermonter, he was living with his family at Adirondac in 1850. Like Gibbs’s census entry, the census taker duplicated Taylor’s record and identified him as both carpenter and millwright, and as 46 or 47 years old (USBC 1850).

Either individually or collectively, McIntyre, Robertson, Porteous, Gibbs, and/or Taylor selected the most advantageous location in the Upper Valley of the Hudson River for the new blast furnace. The location, about 1 mi. south of the village, featured a prominent, steep hillslope proximal to the river. The elevations afforded a level charging bridge to the top of the furnace and relatively gentle side slopes for roadways to traverse up its flanks (Staley 2004). The previous furnace, especially after various enlargements, probably required a ramped bridge. The river and water power were close, and the constricted valley along this reach offered a perfect location to construct a dam. The impoundment area above the dam would not interfere with upstream dams and waterwheels (although it did interfere with a clay source and, possibly, its brickworks). The site was at the uppermost location for slack-water navigation provided by the dam at Lower Works. Stone, timber, lime, and ore could be transported north, and iron could return southward to Lower Works (Seely 1981: 132).

Site preparations and leveling were initiated prior to October 1849. The manager was told by the owners to proceed slowly and to limit expenses. The exterior stone shell of massive anorthosite blocks was completed during the summer and fall of 1850. The structure featured rubble-core piers or pillars reinforced by diagonal ironwork. Firebrick was shipped in from Crown Point over the next two years. Perhaps work on the arches or the rough outer layer of stack lining continued through that period. The arches between the rubble-core piers were constructed of two layers of common brick and covered with firebrick. The core of the furnace was lined with firebrick backed by fireclay, sands, rubble fill, and another course of brick. The stack and the charging bridge may have been finished by 1851, but the economic decline and the slowdowns in construction were marked by the dismissal of 20 men, some of whom had been employed at the works since 1838. During the winter of 1851/52, many of the cast-iron machine parts were delivered. The furnace had been lined by 10 July, but masons could not finish the chimney and heat exchanger until the arrival of the last stovepiping in 1854. Likewise, the furnace base or the hearth could not be completed until after August of 1852, as the sandstone blocks had not yet arrived. The brickwork above must have been fixed to the wall or set up on headers to be infilled with the sandstone later. Work on the furnace came to a complete standstill in 1853 while waiting for the blowers and other components to arrive the next year. The first blast was initiated in August of 1854 (Seely 1978: 122–126, 144, 190). The construction history described above proceeded in fits and starts. Both this schedule and the lack of a simple bottom to top building sequence are related to material shipment and transport issues, as well as corporate finances.

The lull in construction during 1853 coincided with active negotiations with investors for a possible sale of Upper Works. A contract of intent was signed with Benjamin Butler on 27 July 1853, though negotiations continued through early 1854. Due to various lawsuits and failed contracts, it appears that Butler transferred his contract for the works to the partnership of Stanton and Wilcox (Seely 1978: 128–129). The furnace likely operated in two, separate, long campaigns from August to December of 1854 and then January to June of 1855, although the timing is uncertain. Stanton and Wilcox ran the first campaign, but failure to make contract payments prompted McIntyre and Robertson to again take control in January 1855 (Seely 1978: 144, 147–149).
Figure 3. Detail of the New Furnace Site Plan. (Figure by Heather Clark, 2012; adapted from HAER [1978: 2].)
The ironmaster or furnace master at New Furnace was Edward S. Curtis. Although it is not certain that he initiated smelting at the beginning of the Stanton and Wilcox campaign, he was in charge when McIntyre and Robertson retook control. Curtis agreed to continue on for the second campaign and acted as master until he blew out the furnace in June of 1855. Curtis was 26 years old and managed approximately 20 employees. At the start of the second campaign, he had negotiated a workers’ strike settlement and reduced the workforce. Stanton and Wilcox’s inability to make payroll had precipitated the problems. A second ironmaster, 34-year-old William D. Huff, was also in residence and, given his invisibility in the documentary record, was likely an assistant (New York State Census 1855; Seely 1978: 148–149).

New Furnace was dormant after 1855, and activities at the Upper Works were limited to subsistence farming for the caretaker and periodic logging. During the late 1870s, various sportsmen’s clubs began to use the village. The wooden superstructure covering the charging bridge and the casting house, as shown by Lossing in 1859 (fig. 4), had largely collapsed or had burned 27 years later (fig. 7). Fire destroyed all structural evidence of the riverside wheelhouse, compressor sheds, and carpenter shops just after the turn of the century (Seely 1978: 192).

Archaeological Methods

Planned stabilization efforts were focused on the top of the blast furnace and its arches;
therefore, testing was limited to areas under the arches and immediately surrounding the blast stack. Specifically, excavations at New Furnace included two quadrants of the northern arch, a series of $1 \times 1$ m excavation units in the east or hearth arch, a unit just outside the furnace in the area of the casting house, and another outside the western arch between the furnace and the retaining wall (Fig. 8). Excavations proceeded by natural levels, and all sediments were screened through ¼ in. mesh. Building materials, such as brick, anorthosite, and sandstone, were tallied and weighed by unit and level in the field. Slag was also weighed in the field and sampled.

Results

Stratigraphy

The basic stratigraphic sequence is clearest in the northwestern quadrant of the north arch (Fig. 9). Immediately above a stone floor, a thin layer (Level 4) of crushed brick and mortar in a matrix of silty sand possibly represent the earliest phase of brickwork (Fig. 9, No. 4). Relatively sterile, gray sand covers this layer nearly everywhere at the site (Fig. 9, No. 3). The sand may have been intentionally distributed to create a very smooth and clean working surface. The surface of the sterile sand level is typically darkened by charcoal, as are the mottled dark brown-gray sands immediately above Level 2 (Fig. 9, No. 2), suggesting they are working levels. A thin, organic lens of decaying wood was noted in the northwestern quadrant of this arch, just above this level, perhaps marking the collapsed debris from the adjoining wooden structure seen in 1886 (Fig. 7). The surface layer (Level 1) of gray loamy or silty sand includes numerous large and small fragments of brick and other construction materials (Fig. 9, No. 1). Stratigraphy in the southeastern quadrant is different, in that there are multiple, steeply sloped strata from the furnace core representing construction-material debris flows of oxidized sands, broken brick
may have resulted from the accumulation of unfired clay from the taphole plug mixed and trampled with the slag waste tossed along the side of the iron runner. This is capped with a black charcoal-rich level of loamy or silty sands that thickens toward the mouth of the arch. This charcoal-rich level also contains slag, as well as ore fragments and flux, likely representing the flow of materials left within or on top of the furnace after the last blast. The surface layer contains brick and firebrick rubble in a matrix of dark gray silty or loamy sands. Toward the mouth of the arch, TU 3 revealed stratigraphy strongly affected by operations at the terminus of the iron runner. The profile shows a ditch, extending from the runner, cutting through the yellow-brown mottled clay soils and into the clean, dark gray sands (FIG. 10). The trough itself is filled with the black charcoal-stained and slag-rich sand also observed above the clay layers in the arch midsection and appears to be a post-blast raw-material flow. This trough fill is capped by
Figure 7. Edward Bierstadt’s 1886 artotype, *Old Furnace, Deserted Village, Adirondacks, N.Y.* (Image courtesy of Ed Palin.)

Figure 8. New Furnace site map with excavation units. (Map by Heather Clark, 2011.)
mottled, dark gray and olive-gray mortar-rich sands, all overlaid with brick rubble in a matrix of black to dark gray sands. Decayed wood, found at the contact between the black trough fill and the mottled sands above, marks the possible collapsed wood furnace sheathing or casting-house superstructure.

Preoperational construction requirements and post-operational decay processes complicate the stratigraphic record near the core. In this area, an additional red-stained, brick-and-mortar crumb-rich sand lay above the sterile gray sand, perhaps marking the completion of the last phase of brick masonry work near the hearth prior to the initial blast. Above this construction lens was another level of sterile gray-brown sands or the sandstone stoop near the hearth supporting the iron runner. The sterile sands were covered with multiple levels of charcoal-stained, mottled, yellow-brown clays. Like those in the northern arch, the levels above slope strongly down toward the arch mouth and consist of dark brown and red-brown layers of sand that are the result of postoperational construction-debris flows from the furnace core.

In general, the lowest strata correlate with the periods of construction from 1849 to 1852, with one location that illustrates the pause in construction prior to finishing the hearth soon after August 1852. Burned sands and mottled clay-and-slag deposits represent 1854–1855 operations, with layers above representing early abandonment and collapse, followed by dissolution during the last three decades.

**Structures and Features**

Excavations in the northern arch showed the furnace was built upon a relatively level anorthosite cobbled floor, with all spaces filled with soft mortar. These floor-level rocks had
Staley/Adirondack Iron and Steel Company’s “New Furnace” with moisture control and drainage (Overman 1850: 154). Although excavations found no evidence for drainage features, they may be present elsewhere in and around the structure. Null (2009: 53) commented on the dissolution of mortar from the stack above. Perhaps the mortar found in the floor and the subfloor had washed down through the masonry and been redeposited.

Masonry work around the tuyere in the northern arch consists of a seven-course, common-brick stoop beneath the cast-iron blast pipe. Along the flanks of the opening, the walls tapered inward toward the hearth using end-skew bricks. The upper portions of this enclosure were likely finished, but vandalism precludes a complete description. Bricks were also used to stabilize or mark the bustle-pipe terminus resting directly on the cobble floor. The hearth arch also featured a masonry stoop and additional examples of brick supports, yet these are better discussed in the context of the iron runner.

In the hearth arch, excavations uncovered the cast-iron trough or runner that had been cast in three sections, each approximately 30 cm (12 in.) wide, with 27 cm (11 in.) sidewalls, and variable lengths between 92 and 102 cm (36 and 40 in.). The upper section near the hearth appeared to have remained stationary. Notably, this section contained a flow of iron from the last blast. The runner was positioned immediately in front of the taphole, resting upon a sandstone masonry ledge or stoop. The other end was resting upon sterile gray-brown sands, reddened or oxidized, and adjacent to the base of the trough. In the narrow space south of this section of runner, stratigraphy suggests the charcoal-stained, yellow-brown clays with slag had built up above the sterile sand. This working level was covered by reddish sands and paved with bricks, creating an upper ledge or stoop level.
with the top edge of the runner. This masonry limits the range of the runner toward the south and was perhaps constructed after the first campaign. No similar constraint was found to the north, although the lower sandstone stoop is irregularly stepped upward on that side. Another brick stoop at the same elevation as the top edge of the runner is located well north of the taphole and was possibly aligned with the slag notch depicted in the HAER drawings (Fig. 5). A gap between the first and second section of trough is 15 cm (6 in.) wide with a vertical rod (1 in. or 2.5 cm in diameter) positioned along the south side. The rod may have supported a short trough section or, perhaps, a tool or gate that controlled the flow of the molten metal. No matching rod was observed in the north gap. The iron mass solidified in the upper section of runner supports the idea that a gate blocked flow at this point. The middle and outer segments of trough rest upon and within the charcoal-stained, yellow-brown clays mixed with slag. This suggests these runner sections were definitely elevated through the course of operations. The third segment was fragmented, and side walls had been patched with small cast-iron tablets and propped by bricks and lumps of pure clay (Fig. 11). This appears to have been an expedient and temporary solution to this structural problem. As previously stated, this runner outlet into trenches excavated through multiple clay strata and based in sterile sands (Fig. 10). The multiple overlapping trenches support the conclusion that the iron runner had been raised through time.

Two additional metal rods were positioned north of the first segment of trough. One, measuring 2.5 cm (1 in.) in diameter, 86 cm (34 in.) long, and having a wedge-shaped tip, had been hammered into the floor immediately east of the lower sandstone ledge, approximately 50 cm (20 in.) north of the iron runner. Another, slightly shorter at 76 cm (30 in.) and of variable diameter, ca. 2.5 cm (5/8 to 1 in.), had been hammered just into the cobble surface. This was located 75 cm (30 in.) north and 15 cm (6 in.) east of the first upright. These may have functioned as guides for some other iron runner used for the slag, supports for the hydraulic cooling lines feeding the tympan and dam plates, or tool rests.

Artifacts

The artifact assemblage from the pre-abandonment levels constitutes only 19% of the total 2,366 items from the excavations. After excluding wood, charcoal, soil samples, slag, scale, ore samples, unidentified iron, and brick and mortar from the 2,366 item total, the lower levels contribute 253 items to the other 1,650 recovered, or a little over 15% of the total (Tab. 1). Given the paucity of artifacts associated with construction and operations, analyses of building materials, smelting raw materials, and slag contribute significantly to the archaeological record and are described below. For the purposes of this article, the focus will be primarily on the early assemblage subset.

In the hearth arch, the sand level above the deposit immediately above the cobble floor is extremely sparse (Tab. 1). Besides machine-cut and unidentified nails, it included an ox shoe, a bolt, a single fragment of aqua bottle glass, two plain white-clay pipe stems, and a vertically ribbed or cockled pipe-bowl fragment.

In the hearth arch, sand level above this contained slightly greater numbers of artifacts (Tab. 1). Cut and unidentified nails were also found, as were a white-clay pipe stem and a pipe-bowl fragment decorated with an eagle image, a fragment of lamp glass, and one buff and two gray fragments of salt-glazed stoneware with brown slip.

The charcoal-stained northern arch sands and the mottled clay deposits in the hearth arch represent operational levels at the furnace (Tab. 1). In the northern arch, 20 cut nails, iron-pipe fragments, a square-headed bolt, a square-headed nut with a sheared bolt, and 2 iron binder keys were discarded on the work floor. More closely associated with the workers toiling around the blast pipe are clear and green bottle-glass fragments, two white glass buttons, and three plain kaolin-pipe fragments. At the hearth, single fragments of green, brown, and clear bottle glass, gray salt-glazed stoneware, undecorated whiteware, lamp glass, and a clear table-glass bowl rim illustrate the variety of items lost on the floor. The whiteware and clear glass were burned and melted, attesting to the conditions in the arch. Broken into four fragments, a crosshatched white-clay pipe bowl was decorated with the raised letters: T D, surrounded with a circle of five-pointed stars. Another row of stars circled the bowl (Fig. 12).
This type of pipe was in common use between 1830 and 1860 (Pfeiffer 2006: 41, 127).

Notably, limited evidence of hand tools or tools associated with smelting operations was found in the assemblage. A single iron chisel was recovered from TU 6, a test unit from within the bounds of the casting house. The tool is likely a “narrow chisel,” with an octagonal shaft at the head end measuring 12 cm (4.7 in.) long with a diameter of 3 cm (1.2 in.) below the head (FIG. 13). The size suggests the tool was completely worn out, being almost too short to hold and strike with a hammer. Contrary to post-abandonment descriptions (Manchester 2010a: 135), the hearth arch appears to have been stripped.

One can assume that Robert Hunter and succeeding caretakers made use of any tool left behind, but it appears the club phase of occupation had a greater impact. A single fragment of a melted tuyere was recovered from a test unit in the south arch, and a more complete specimen was recovered from TU 7 west of the furnace. Masten (1935: 17) notes several cottages contained pairs of tuyeres being used as andirons. Iron vents from the charcoal kilns were reused around the village as cellar air vents and boat anchors. Excavations at the MacNaughton Cottage found stacked iron pigs used under a porch as joist supports. “E. L. & E. H. Farrar” firebricks, imported for use at the New Furnace, are incorporated into various club cottages in Adirondack (Staley 2004, 2006).

**Masonry Materials**

During excavations, various types of brick, sandstone, and anorthosite fragments were counted and weighed. An analysis of the size, grade, and spatial distribution of these materials generally supports field observations and provides insights into facility construction, use, and decay. Greater volumes of masonry

**Figure 11.** Brick and clay props used as expedient repairs to the iron runner. (Photo by author, 2006.)

3. Additional supporting data and graphics can be found at https://www.academia.edu/26060722/SUPPLEMENTARY FIGURES_AND_GRAPHICS_TO_LAST_GASP_THE_CONSTRUCTION_OPERATION_AND_DISSOLUTION_OF_THE_ADIRONDACK_IRON_AND_STEEL_COMPANY_S_NEW_FURNACE_
Table 1. Artifact contents by test unit and level.

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Note: The levels presented represent natural strata that do not have 1:1 relationship with levels as actually excavated.
*Total includes items not listed such as brick, mortar, charcoal, wood, slag, scale, ore, unidentified iron, etc.
†Modern items include foils, plastics, paper wrappers, light bulbs, twist-off caps, etc. All likely associated with the last four decades.
‡Number in parentheses is modern or recent glass also likely from the last four decades.
Table 1. Artifact contents by test unit and level. (continued)

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<td><strong>Total</strong></td>
<td>193</td>
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Note: The levels presented represent natural strata that do not have 1:1 relationship with levels as actually excavated.
*Total includes items not listed such as brick, mortar, charcoal, wood, slag, scale, ore, unidentified iron, etc.
†Modern items include foils, plastics, paper wrappers, light bulbs, twist-off caps, etc. All likely associated with the last four decades.
‡Number in parentheses is modern or recent glass also likely from the last four decades.
materials were found near the floor surface and closer to the blast-furnace core. Quantities decreased in working levels and increased again in upper levels representing abandonment and decay. Anorthosite, used to construct the massive exterior stone shell, is generally evenly distributed, including in areas outside the structure. Similarly, common brick and firebrick, both used at the core and in the ceilings of the arches, are widely represented. In contrast, sandstone, with a specialized use in the crucible or hearth, was concentrated near the core. Sandstone near the mouth of the arch was restricted to surface contexts, where it suggests recent disturbances.

Size-grade analysis of the same materials indicates the volumes of building materials closest to the floor are of a very small size. Smaller-sized fragments are generally found in the working levels as well, with the exception of TU 4 in the hearth arch. There, several bricks and large fragments had been used to prop broken sidewalls of the runner (FIG. 11). These finds skewed the size analysis in that case. The general pattern of smaller-sized building materials in the working levels was not the case for the northern arch, where numerous large-sized building materials were used in support of the bustle and hot-blast pipes. Several of these fragments loosened from their original contexts and were recovered in the sediments. Masonry materials in post-abandonment levels were, on average, more than ten times larger than the floor-level fragments. This pattern illustrates the collapse and decay of the structure, as well as visitor impact. The smaller-sized fragments on the floor and in the overlying sands suggest intentional cleaning and an orderly construction site. The overall paucity and small size of materials in the working levels is likely related to a pair of factors: (1) The furnace had a relatively short use-life, thereby limiting any need for significant reconstruction or modifications that may have introduced building materials to the floor; and (2) given the inherent danger with the smelting process, one might assume the working floor would be kept clear of tripping hazards. The exception to the pattern in TU 4 points toward the use of masonry materials in an interim or emergency repair.

Raw Materials, Waste Product, and Pig Iron

Artifacts associated with production included raw materials, such as iron ore, charcoal, and flux; process materials like clay; and the final product, pig iron. Only three ore samples were recovered from buried contexts, and these were found in the upper levels near the core, presumably washed down from the top of the furnace well after abandonment. Graphitic marble was used as a flux in the smelting process. The source of the marble is near Newcomb, New York (Isachsen and Fisher 1970; William Kelly 2014, pers. comm.). The upper levels of many excavation units contained rhombohedral crystals of the marble, with a concentrated pocket of crystals recovered from the end of the iron runner. Very limited quantities of marble were found in the working levels of the northern and eastern arches. As previously noted, charcoal-stained stratigraphic contacts and lenses were found within the working levels, as well as in the abandonment level. In the eastern arch, the greatest concentration of charcoal chunks and
through the arch would likely be trampled into the clay-covered floor. Although sampled in the field and not systematically assessed during cataloguing, 18 samples of spattered slag were found to hold the possible imprints of tool handles, including square, octagonal, and round profiles. Lastly, two fragments of iron pigs were recovered with one from the surface of the northern arch and the other from the working level of the eastern arch. As previously noted, the innermost section of iron runner contained solidified iron.

Discussion and Conclusions

Isolation and historical circumstances have preserved an excellent example of 19th-century blast-furnace technology. The nature of mining developments, in the broad scope, and the daily conditions and processes, in the narrow view, are at odds with the idea that behavioral details are preserved and can be observed archaeologically. Historical accounts gave hope the operations at the New Furnace would be clearly represented by an array of tools and debris. Perhaps the earliest visitors to New Furnace actually viewed this Pompeian scene: a workplace abandoned and workers and managers anticipating the next campaign. Decades of visitors and vandals have erased much of the picture. Still, much was left behind. Through analysis of the sediments, stratigraphy, features, and artifacts, such as building materials, smelting raw materials, and slag, aspects of construction, operations, collapse, and decay have been revealed. Further, some of the findings may reflect corporate paternalism, as well as the owners’ wildly fluctuating fiscal attitudes toward New Furnace construction and operations.

Excavations uncovered the cobble foundational floor and the underlying rubble fill of the furnace. The construction largely followed published directions (Overman 1850), except for the discovery of mortar in the interstitial spaces. Was it intentional and a clear deviation from Overman’s plans, or is it the result of weathering and redeposition? Historical architects reported that water infiltration had caused virtually all the mortar in the furnace stack to decompose, leaving only loose sand in the joints between the anorthosite blocks (Null 2009: 53). Archaeology also revealed
details about masonry used in the lower areas of the northern arch, such as the brick steps and the bricks used to stabilize the terminus of the bustle pipe. Sandstone and brick were used in the multiple level stoops in the hearth arch. A heavily concentrated layer of small-sized brick fragments and mortar found across all floors marked the period between stack lining and the completion of the base in July and August of 1852. An additional layer of the same materials, found near the furnace core, represents the installation of the sandstone base and brick-wall infill. Size-grade analysis suggests the construction pause afforded an opportunity to clean the job site, clear the floor of large fragments and all but a pipe fragment and a few nails, and distribute an even layer of clean sand.

The amount, size, and distribution of construction materials and artifacts in the operational levels also imply a tidy workspace. During almost constant operations, it seems more likely employees kept the floor clean for safety and efficiency reasons, rather than to keep themselves occupied. A newly constructed furnace would have had limited repair and maintenance needs; therefore, few building materials would be available for incorporation into the floor deposit. Plenty of slag and charcoal had been trampled into the mottled, clay-rich sediment, however. Rarely, pipe bowls, buttons, ceramic fragments, and glass shards found their way to the floor. The upper section of the iron runner remained stationary. Several paving bricks limited the southward lateral movement of the trough. These bricks were placed after several smelting sessions or, perhaps, at the break between campaigns. Lower segments had been elevated vertically. The defined channel at the mouth of the trough argues against horizontal movement.

The mass of hardened iron in the upper segment is the only remnant of Masten’s abandoned workplace, and the gap in the trough below this mass may indicate a gate at this location. Bricks and clay lumps propped up broken segments of the iron runner, demonstrating not only an expedient solution to an immediate problem during operations, but also pointing back toward the managerial frugality expressed so often in the historical record. In the absence of the actual artifacts, slag-spatter casts of tool handles contribute to a sense of tool inventory. Future investigations should be alert to the possibilities of these artifacts.

The charcoal-rich sands, containing slag, ore, and flux, filling the lower trough and the channel and capping the mottled clay deposits, suggest a period of stability when debris from the top house and inside the furnace washed into the hearth arch. The collapse of wooden sheathing over the furnace, at some time between 1859 and 1886, is marked in the stratigraphy of both arches. Both the amount and the larger sizes of the masonry building materials attest to the eventual, yet rapid, partial collapse of the arches, face walls, and stoops. The steep, angled flows of fine materials from the core are the result of more recent internal collapse. The volumes of artifacts in the upper levels are associated with visitors and vandals of the last century. Their curiosity has accelerated the rate of structural decay.

Corporate management’s attitudes regarding the ironworks development and New Furnace shifted dramatically through time, vacillating from enthusiastic optimism and full funding to reluctant support and fiscal austerity. Although this vacillation occurred at a frequency beyond archaeological resolution, the attitudes may be reflected in aspects of the materials used, craftsmanship, tools, and other behaviors. Despite using a variety of firebrick suppliers and continually searching for a means to make its own firebrick, management recognized the superiority of New Jersey firebricks and briefly committed to purchasing the more costly bricks exclusively (Staley 2012: 13). Assuming that evidence of fine craftsmanship or work details far exceeding functional necessity was supported and intended by management, then the diamond-shaped and semi-circular designs on the iron faceplates in the arches point toward management interest in aesthetics (fig. 5). Patterned brickwork in the arches and the finely dressed outer corners of the stack also suggest generous support. The owners may have felt the efforts added “curb appeal,” facilitating eventual sale. The extremely short chisel stub (fig. 13) and the expedient use of clay lumps and bricks to prop broken segments of the iron runner (fig. 11) are illustrations of the opposite, more frugal, attitude.

The paternalistic policies of Adirondack Iron & Steel Company management can be
seen in its attempt to create a complete community for its workforce, as well in its attempt to enforce temperance. The partners brought teachers, ministers, and physicians to the community and supported the postal service, a store, and a bank. The company constructed and provided families with housing in standardized duplexes or “doublehouses.” Although it also had a larger boardinghouse for single workers, the company favored married men with families (Ralph 1851), assumedly for their stability and greater discipline. The company’s motivations were mixed. The principals were devout Presbyterians, and they felt that their company town should have a minister. Correspondence suggests they themselves recognized mixed motives. In 1845 Henderson wrote to McIntyre: “It is our duty to see that this settlement should not go on without the privileges of the Gospel. While it is our duty in a high sense, it is likewise in our interest” (Henderson 1845). Their religious beliefs and their devotion to science and innovation prompted them to support educational efforts, temperance, and to protect families.

The early phases of New Furnace construction had proceeded under management guidelines to go slowly and limit expenses, although correspondence suggests a normal level of expenditures and activities at the works. By fall of 1851, the furnace stack was largely finished, including the trestle charging bridge. At this point management laid off employees, retaining the married family men who were kept busy making charcoal, mining ore, and hauling logs. By springtime of 1852, this minimal crew had stockpiled a greater than six-month supply of wood, charcoal, and ore. During 1852 and 1853, there was little to nothing accomplished at the works, except the construction at New Furnace. The brick lining had been completed by 10 July. and work needed to stop until later August, when the sandstone arrived for the base of the stack. Work completely stopped during 1853 while awaiting delivery of metal castings for the hot-air stove and chimney (Seely 1981: 122–126). The size-grade analysis found a large amount of exclusively small-sized brick fragments on the cobble floor. This brick crumb layer had been covered with an approximately 15–20 cm (6–8 in.) thick layer of clean sand. The well-sorted character of the brick level suggests the work area had been intentionally cleaned prior to being buried. The thickness of the sand would have adequately covered and sealed larger brick fragments, thereby making the brick clean-up unnecessary (Kammel 2005: 54; Asphalt Institute 2016). The reduced workforce, previously trimmed by the layoffs in November of 1851, had completed all its other assigned tasks by spring of 1852. The clean up of construction debris from the furnace floor in late July and early August was “make-work” intended to keep the employees occupied and retain a workforce at the village. Assuming management sanctioned this strategy, the event is a reflection of paternalism archaeologically observed in the workplace. The company was attempting to support and control its remaining workforce despite supply chain difficulties, construction delays, and austere economic conditions. The motives for corporate paternalism are likely very complex and dynamic through time. Christian benevolence on the part of company principals may have formed the foundation (Seely 1981: 81), yet, long-range corporate plans, such as the construction of New Furnace and the sale of the ironworks seem equally important in 1852. Forms of paternalism shifted through time, as influenced by corporate plans, technological shifts, workforce needs, and, perhaps most importantly, by outside economic conditions (Metheny 2007: 10, 14, 17, 55). Adirondack Iron & Steel Company’s paternalistic adjustments are just part of the complex business calculus applied toward corporate goals of self-sufficiency, technological success, and, ultimately, profitability.

Admittedly, the leap from a modified, primary deposit of construction rubble to corporate paternalism requires a number of untestable assumptions. Was the effort to remove large brick fragments recognized by the builders as unnecessary? If so, was the work sanctioned by management? Given that the work was to be hidden from view, there is the potential that management could have been unaware. If so, then labor, in collusion with a foreman, may have initiated the work. The layer of fine brick rubble then becomes evidence for resistance. Given the historical record of corporate paternalism elsewhere in the community, the timing of the construction effort, and the expectation that delivery of furnace components was imminent, the original interpretation is supported.
The analyses of construction materials, debris, and processing wastes revealed aspects of construction, operations, decay, and collapse in this mid-19th-century facility. This study illustrates the potential for the use of mundane artifact classes, such as brick, stone, mortar, slag, charcoal, and flux, that are typically immune from the effects of collectors or salvagers. These analyses will, in the future, become more important to us, whether we are prehistoric, historical, or industrial archaeologists, as we come to grips with sites that have been collected.

The results reported herein were limited by the initial scope of the excavations. Numerous avenues for further research exist at Upper Works. Other than the bunkhouse and the manager’s house, none of the company-built domiciles has been archaeologically identified. It is assumed that later club-related construction has incorporated or obscured the earlier dwellings. Given the successes at other company towns, the potential to study capitalism and corporate paternalism is much greater in the extensive domestic deposits at Upper Works, rather than in or around the industrial facilities. Much more can be learned about the evolution of blast technology at the works by investigating the various facilities and systems arrayed across the landscape. More detailed questions about the successes and failures of equipment and processes might be approached with chemical analyses of slag. Questions regarding the use of mortar in the furnace base might also be approached through chemistry. Future studies should be aware of the potential of using iron and slag splatter to identify tool and tool-handle forms. Upper Works and New Furnace are exceptionally well preserved, and potential research into industrial technology and archaeologies of capitalism is indeed limitless.

These archaeological efforts have contributed detail to the rich documentary and architectural record associated with this blast furnace. Excavations exposed design and structural elements that were hidden from the architectural historians. Several individual, ad hoc actions or behaviors were revealed, such as the use of bricks to mark and stabilize the air-blast bustle pipe during installation and the use of bricks and clay lumps to patch the iron runner. That incident of impromptu ingenuity and the single heavily worn chisel are archaeological illustrations of the frugality theme prevalent in company correspondence. Several other observations correlate with the historical record. Multiple lenses of brick debris correlate with delayed material shipments and a lurching construction schedule. The extraordinary and unnecessary care taken by workers to clean the construction site and prepare a working surface fit a period of slack work just after significant layoffs. This “make work” may be an example of corporate paternalism and represents one of the small contributions toward the historical archaeology of capitalism (Leone 1999: 19). In an effort to attract potential buyers to its development, the Adirondack Iron & Steel Company spent over four years and $43,000 to build the New Furnace. The furnace operated for a year, in what turned out to be the company’s last gasp. Although impacted by 150 years of exposure to Adirondack winters and curious visitors, the archaeological deposits at Upper Works and New Furnace have only hinted at the secrets they hold regarding the mid-19th-century iron industry.

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