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Dianne Newell, Editor

T A B L E O F C O N T E N T S

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THE COVER--Illustration from an advertisement (1913) by Coppley, Noyes, and Randall, Ltd. ("Proper Clothes for Men and Boys"), Hamilton, Ontario.

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I N T R O D U C T I O N

This Symposium represents the Society's first formal attempt to explore the relatively neglected analytical aspects of industrial archeology. It is intended as a starting point for continuing discussion on how the discipline might better contribute to an understanding of human behavior in the past.

Originally prepared for Symposium discussion, the papers published here reflect in varying degrees criticisms and advice generated during intensive sessions over two days. Because of the common forum and because each participant addresses only an aspect of the overall problem--the place of industrial archeology in the human sciences--the papers should be read more as a "suite" than as a collection of individual works. Some repetition will be noted. Readers are asked to be patient; this overlap results from an editorial decision to preserve the internal logic of individual essays.

The opening paper places industrial archeology in a social scientific tradition. Historical problems, data-gathering techniques, artifact analysis, and interpretive schemes are explored in presentations that follow. The thrust of the Symposium was to examine industrial archeology as a scholarly discipline. However, the range of concerns reflected in many of the working papers represent a second level of discussion. Recognizing that the "data" of industrial archeology are particularily threatened with loss or destruction, a number of participants chose to discuss issues related to public awareness and government activity connected with an industrial patrimony. The role of industrial archeology in cultural resource mangement and the intellectual and social context of industrial archeology in Italy are put forward in this section. The evaluation of industrial collections in museums and of a "living" industrial community conclude the discussions.

The need to discuss such issues and the particular commitment to tackle intellectual problems as a group, rather than in isolation, has as its roots the Landon Project, an interdisciplinary historical study of Southwestern Ontario. Our diligent colleagues from Milan, Ornella Selvafolta and Paolo Caputo, clearly left more behind than ever they took away. Vance Packard, in addition to valuable intellectual support attended to the finances and, with Brenda Barrett, our excellent accomodation. Robert Vogel's time and talent in producing this publication are greatly appreciated. Others who contributed in important ways include Richard S. Alcorn, William B. Bassett, Richard M. Candee, Michael W. Robbins, and Edward and Mary Jane Rutsch. To all of you and especially those contributing to this rewarding volume, my sincere thanks.

Dianne Newell
London, Ontario
1978

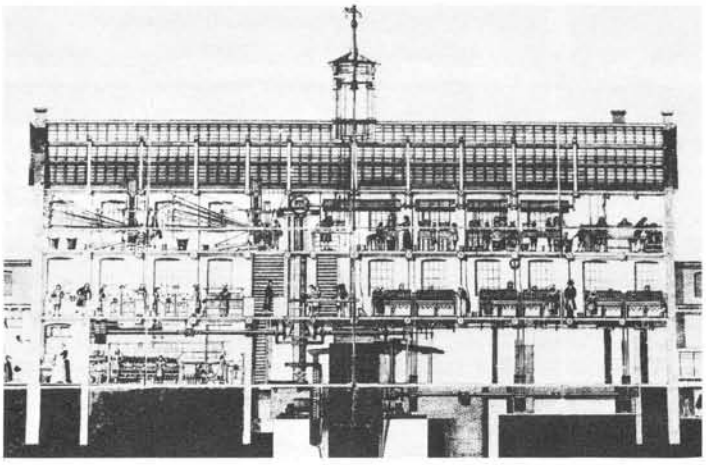

Figure 1. Industrial remains offer to scholars a unique set of "unintentional" sources with which to explore important questions about past. In order to do that successfully, industrial archeologists ultimately must regard factories, mines, and the like as working places, not simply as architecture and equipment. This extraordinary drawing (c1800) of the Bedworth Mill (worsted), Warwickshire (Tann, Development of the Factory, p. 38) serves as a reminder of the behavioral base of IA investigations.

Figure 2. The potential rewards of systematic analysis of historic artifacts are illustrated by this map of Middle Virginia and environs. The black spot in the white area surrounded by shading is that surveyed by Henry Glassie in his folk housing study (1975: 15). The white space is the region of which the surveyed area is being presented as a sample. The shading indicates the zone to which architectural affinities are next closest. Instead of the mere chronicling of particular sites, or "insights" about the past, Glassie contributes an important analytical framework within which to study large-scale artifacts, as well as offering explanations of particular architectural petterning that apply to an area much larger than that surveyed.

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I

INDUSTRIAL ARCHEOLOGY AS A SCHOLARLY DISCIPLINE

1 INDUSTRIAL ARCHEOLOGY: DISCOVERING MORE ABOUT HUMAN BEHAVIOR IN THE PAST[1]

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The human sciences are, to paraphrase a widely known French historian, Marc Bloch, only "authentic" when they succeed in establishing explanatory relationsips between phenomena.[2] Throughout this century serious scholars of the past have been developing new and more systematic approaches to their investigations.[3] They recognize that human activity is largely rational and very complex and have come to abandon "fortuna" and "chance" as explanation of past behavior.[4] Moreover, they reject preoccupations with questions of origins--establishing the genesis of inventions, determining builders' names, and so on--as an end in itself. Contrary to popular views of the historian's craft, establishing these and other facts is no substitute for explaining them. There is a need to study human behavior systematically over time and across space in order to discover patterns and causal relationships.

Essentially, the goal of this new approach to history is to arrive at reliable explanations of a full range of human experience. To that end scholars are interested in understanding what happened to most people in the past. Of course, many still care to examine the famous people and events of history but many others are finding more fruitful such questions as why children in 1820 worked in factories, yet, by 1880, they went to school. In order to undertake such studies as these attempts are being made to explore a historical record that is both broadly representative and unintentionally informative.[5]

Written documents, long the keystone of historical research, prove particularily inadequate in the sense that they usually represent only those few people in a given culture who could write, or whose lives were judged important enough to report about. Many scholars attempt to make profitable use of statistical information and even to make literary sources, like correspondence and newspaper accounts, quantifiable. The bulk of surviving written documentation, however, consists of purely episodic, narrative accounts such as those found in diaries, editorials, speeches, and institutional records. In addition to their questionable representativeness, such sources are intentionally informative; their authors sought intentionally to influence the opinion of contemporaries or even, as is the case with early local histories and biographies, the impressions of future scholars. Non-intentional sources (maps, artifacts, and the like) differ in that they are symbols less by the intention of their originators. Thus, artifacts from toys to textile factories are among the most genuine of all historical sources. They do not have to be stripped of their "interpretation" in order to be analyzed. In addition, such sources can tell us more than the written record about the young, the old, the propertyless, and about females as well as males--in other words, about most people.

To say, of course, that anyone interested in understanding the past should ignore written documents is absurd. Historic rhetoric can be studied to learn of the intentions and perspectives of its authors; otherwise, the greatest role of literary evidence increasingly is a corroborative one.[6] What is important here is simply that non-intentional sources have a much larger place than ever in the study of human behavior in the past.

What does this have to do with industrial archeology? Industrial archeology--the study of the physical evidence of an industrial and technological past--is becoming an important scholarly discipline. Its rich and potentially productive set of historical sources are uninterpreted and can represent those people who otherwise left no records. Consequently, these are sources of a sort that can compensate for many of the difficulties presented by the written record. An industrial site, such as a brewery, provides information about the physical organization of a workplace. From that information something can be determined about the hierarchical structure of work, about actual tasks performed, and even about the social values embodied in the visible work processes.

Examination of industrial sites also offers insights into the levels of technological sophistication and, hence, the process of diffusion of technological innovation in industries ranging from button-making to steel production. Revealing patterns of technological change lead in turn to analysis of the impact of such change on the workplace, the community, and the society at large. The important broad questions lending themselves to such analysis include: What does this site tell us about the resource base when the site was developed? (We look for the presence of dried up streams, of roads, quarrying, and land fill). What does this site tell us about population characteristics? (How many workers, what skills, what age and sex were likely supported by a site of this scale and level of technology?). What does this site tell us about the economy? the society? Industrial and technological remains will not answer all questions about human behavior in the past. IA sources tell us little, for example, about formal political behavior or about the lives of those at the upper levels of society; such questions, however, are more easily approached through written sources.

Industrial and technological remains, then, offer to scholars a unique set of unintentional sources with which to explore many important questions about the past. Why do we study old factories, mines, canals, and viaducts? Because we want to know more about the

past. But, what exactly do we want to know about the past? Industrial archeologists must know precisely what questions they intend to ask of their sources, why they want the answers, and how the answers fit into some broader explanatory scheme.

From the outset industrial archeologists must develop or adopt appropriate theory in order to infer findings from non-intentional data. The social sciences are a logical course of guidance.[7] The common subject matter of the social sciences is human behavior; what seems to distinguish each is the focus on a particular aspect of this behavior and the techniques which each uses to comprehend their subject matter. Political science, for example, focuses on government. Economics concentrates on the production and distribution of marketable goods. Sociology deals with the many human interactions and structures involved in human systems. These three disciplines seek principles that are independent of time or place and together with traditional history generally are concerned with "intentional" documentation.

It is to these disciplines that one generally turns in the search for basic theoretical propositions about why people behaved the way they did. For example, the very heart of industrial archeology's disciplinary identity--the word industrial--represents an implicit acceptance of a broad range of assumptions, definitions, and theories from economics, history, and sociology about a major historical transformation that occurred between humans and their material surroundings.

For the methodological purposes of industrial archeology, perhaps it is best to pay close attention also to those disciplines (and sub-disciplines) that rely mainly upon non-written records--human geography, folklore, archeology, and architectural history. Of those four only archeology and folklore are especially concerned with the study of non-written documentation, and, more particularly, three dimensional data. The others use non-written documentation and contribute considerably to developing techniques for recording and describing data, but have done so without developing much in the way of a theoretical framework within which to analyze and explain the data. Archeologists and folklorists, by contrast, have devised methods of studying the horizontal (spatial) and vertical (historical) interrelationships of their data and infer conclusions from their sources through analogy with structures and processes perceivable today. Thus, inference by analogy is their method to "observe" the unobservable. Artifacts are studied, like language, as symbolic of culture and behaviour.

Because the symbolic content of such sources as factories is, by definition, not apparent, some methodology must be developed to make sense of that material. Folklorists devise sets of rules, or "grammars" for language, music, and even artifacts like furniture, costume, and most recently, housing.[8] United States' folklorist, Henry Glassie, decided that, of all classes of artifacts, architecture was the best guide to past culture because of its universality, tenacity, complexity, and fixedness.[9] Scholars are indebted to his pioneering efforts in the structural analysis of domestic architecture, for his study surely points the way to the application of systematic techniques to sites of interest to industrial archeologists. For their part, archeologists tend to rely on classification as a prime analytical tool. While traditionally dealing with the analysis of form (parts), structure (relationship of parts), and context of below ground artifacts and assemblages, they recently attempted to devise conceptual tools with which to interpret such surface remains as tombstones.[10] At least one industrial archeologist has raised the need to include workers' graveyards in IA investigations, but he offers no way in which to use that data, other than considering it for the "sake of interest."[11] One thing that archeologists need to do is to establish the grammar (rules and relationships) of industrial sites.

What is lacking overall is a systematic approach to industrial archeology. Without this we are merely chronicling series of interesting facts, or sites, or "insights" about the past. Most often the sites are studied simply as objects in themselves. Like traditional historians, industrial archeologists have a tendency to focus on the unique, the "successful," and the exquisite. The works of prominent architects and engineers, the novel, and the structures with the best survival rate inevitably receive the most attention in North America and elsewhere. Consequently, there is little search for and study of the remains of common industrial activity or sites more representative of the experimental and transitional stages of development, or even of the failures. As systematic investigators, industrial archeologists must develop sampling procedures, classification schemes, and sets of logically derived hypotheses with which to select, investigate, and interpret their sources. Being aware of the kinds of historical questions that their sources can answer will be an important first step to more useful surveying and recording efforts.

Data gathering in the sense of identifying and recording industrial and technological remains is the only area in which industrial archeologists have concentrated to date. There is a danger in having proceeded with this stage without first stating explicitly what the questions are, why they might be important, and exactly what material will be used to answer those questions. None of the present manuals on recording techniques address this crucial problem. Whether or not they are stated, guiding principles always underly an approach to investigations; the implicit questions that industrial archeologists use in deciding what to study; what details or aspects to record; what to draw or photograph; and what to describe in other ways, shape the final outcome of the study, no matter how objective investigators pretend to be.

Consider, for example, how IA site teams often will faithfully record floor plans of factories, carefully positioning all extant production and power transmission equipment. Such scale drawings provide a record of the spatial relationships within a given workplace, but the real contribution of such material to understanding the social impact of technological change remains undeveloped. Without posing questions before approaching the data it is likely that recording teams will continue their current practice of including information about process and equipment in drawings only when such information is abundant. If industrial archeologists were first to determine just how many important questions about changing notions of work, changing relationships between workers and management, and changing structure of the industrial workforce, to name but a few, could be measured by such spatial data, then surely recording teams would be obliged to record spatial relationships--even when all equpiment had been removed. A wealth of evidentiary material--everything from external buttressing and bricked up windows, to excessive wear on the floors and large dimension screw holes in the supporting columns--will go a long way to supplying missing information.[12] Relying on descriptions supplied by contemporary dictionaries of manufactures and surviving drawings will not do. Contempory descriptions of process and architecture are largely idealized and they, together with drawings that survive, seldom can be assumed to represent much more than the most successful of industrial

enterprises.

Finally, descriptions, whether literary or graphic, seldom inform of changing conditions over time and across space, whereas physical remains are much more likely to provide such information. An exceptionally thoughtful piece was recently published on the impact of the industrial revolution in Britain on the nature of work. The question tested was that mechanization in the "age of steam" was largely confined to a few, isolated operations within most industries; as a result, the increase in scale and range of production caused by the industrial revolution proportionally increased, rather than decreased, manual labor and hand technology--a notion seldom considered by scholars. The evidence used to analyze this question, however, was limited to contemporary accounts of industrial process discovered in manuals on manufacturing and in a handful of workers' diaries. The origins and bias of these sources went unquestioned. More important was the failure to consult physical evidence presented by surviving industrial sites, so that the conclusions, while highly interesting, do not necessarily reflect what actually happened.[13] Conversely, another study, that of the impact of technological change in the brewing industry on brew house architecture, analyzed written, graphic, and physical data but never once suggested why such information might be important to understanding the past.[14] In the case of the first study, the questions were well developed but the data were insufficient to produce reliable conclusions; in the second, the data were stronger but a theorectical base and testable questions were missing. The task ahead for industrial archeologists seems clear.

The new scholarly horizons for industrial archeology are behavioral and scientific ones. As a beginning, factories and mines can be regarded as working places, not simply as architecture and equipment; bridges and lighthouses can be viewed as significant elements of human transportation and communications networks, not merely as engineering and design. By focusing on actual remains and developing appropriate theoretical perspectives and investigative techniques, industrial archeologists are capable of expanding in special new ways our knowledge of human behavior in the past and our general understanding of the human experience and its meaning.

Footnotes

1. This paper owes a great deal to intereaction with colleagues in the Landon Project, University of Western Ontario. My greatest intellectual debt is to Project Director, Richard S. Alcorn, who both encouraged the preparation of this paper and offered invaluable criticism.

2. Marc Bloch, The Historian's Craft: Reflections on the Nature and Uses of History and the Techniques and Methods of the Men who Write it (1935; reprint ed., New York: Vintage Books, 1953).

3. In addition to Bloch, see: Lee Benson, Toward the Scientific Study of History: Selected Essays of Lee Benson (Philadelphia: J. Lippincott, 1972); Robert Berkhofer, A Behavioral Approach to Historical Analysis (New York: The Free Press, 1969), and, Alfred Kuhn, Unified Social Science: A System-Based Introduction (Homewood, Ill.: The Dorsey Press, 1975).

4. See especially, Benson, Scientific Study, pp. 14, 220; and Berkhofer, Behavioral Approach, pp. 11-12.

5. Important discussions of the value of non-written and non-intentional documentation appear in Raphael Samuel, "Local History and Oral History." History Workshop 1 (1976): 191-209; Henry Glassie, Folk Housing in Middle Virginia: A Structural Analysis of Historic Artifacts (Knoxville, Tennessee: University of Tennessee Press, 1975), Chapters Two and Three; and Josè E. Igartua, "Non-Written Documentation as a Source for Interdisciplinary History." Mimeographed. London, Ontario: The Landon Project, University of Western Ontario, 1977.

6. Glassie, Folk Housing, p. 14ff.

7. In this section I rely heavily on Igartua, "Non-Written Documentation," and Kuhn, Unified Social Science.

8. For an exhaustive review of the field, see: Henry Glassie, "Structure and Function, Folklore and the Artifact." Semiotica 7 (1973): 313-51.

9. Glassie, Folk Housing, Chapters Two, Three, and Seven.

10. J. Deetz and E.S. Dethlefsen, "Death's Heads, Cherubs, and Willow Trees: Experimental Archaeology in Colonial Cemetaries." American Antiquity 31 (1966): 502-10.

11. Kenneth Hudson, The Archaeology of Industry (London: Thames, 1976).

12. A highly useful discussion of this is found in Eugene J. Webb, Unobtrusive Measures: Nonreactive Research in the Social Sciences (Chicago: Rand McNally, 1970). For one explanation of the "representivity" of contemporary drawings see, Jennifer Tann, Development of the Factory (London: Cornmarket Press, 1970), p. 2.

13. Raphael Samuel, "The Workshop of the World: Steam Power and Hand Technology in mid-Victorian Britain." History Workshop 3 (1977): 6-72.

14. Dianne Newell Macdougall, "Changing Brewing Technology and Related Effects on Brew-House Architecture in 19th Century North America." A paper presented at the Annual Meeting of the Society for Industrial Archeology, April 1973, at Troy, New York. Mimeographed.

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2 THE "QUESTIONS" OF INDUSTRIAL ARCHEOLOGY

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The only reason that there are archeologists in the world is because historians have not been able to answer all the questions. Unfortunately up to this point, industrial archeologists have barely been asking questions. Some thought needs to be given to the type of questions we ought to be asking and even more thought to the ways in which we as archeologists--the students of objects--go about answering them.

Industrial archeologists are fortunate in a sense because the questions most commonly asked by prehistoric archeologists can usually be answered quickly and accurately by industrial archeologists with minimal historical documentary research. It is seldom necessary to excavate a mill site to find out what went on there. County histories contain that information. Industrial archeologists must go beyond the printed histories if they are to make any contribution. It took prehistoric archeologists decades of research before they located cultures in time and space precisely enough to begin looking at the other aspects of culture. For the industrial archeologist these concerns can usually be answered in a few days at the local library.

What then should the industrial archeologist be studying? They can, of course, study industrial sites and objects with the hope of learning more about the objects, but this should be only a temporary or initial step. Ultimately the only reason for studying objects at all is to learn more about the persons associated with them and the greater network of which they form a part. Specifically, they should be concerned with persons associated with the manufacturing and use of an object. The inventor/designer is perhaps more clearly the focus of those concerned with the history of technology. Usually, it is obvious who made an object and who used it, but too rarely do we consider the effect this making or using may have had on the person and to what extent the manufacture or utility was part of a system or pattern of behavior.

A few sample "questions" should serve as illustration. Consider a metal planer from the 1870s. Various places on it have decorative moldings that serve no particular function, but are pleasing to the eye. The application of such moldings was fairly common on machine tools of that period and can be considered as a custom or tradition even though they would disappear within the next 25 or so years. The question is this: Did the use of decorative moldings on machine tools originate with the designer/inventor who wished to make their invention more attractive or with the pattern maker who learned wood workings from a cabinet maker?

Second: Gristmills appear identical to each other; each one also appears unique. The sameness is no doubt the result of the pattern established by Oliver Evans, and the uniqueness may be the result of individual millwrights making imperfect copies, but that explanation seems incomplete. There may be both regional and ethnic patterns at work or perhaps the variation is a function of different "families" of millwrights.

Third: It is observed that various types of industries tend to be located in similar topographical situations. In most cases there are clear functional reasons for the locations, as Edward Rutsch has shown with his study of lime kilns in northwest New Jersey. However, in some instances reasons are obscure. For instance, small early saw mills in Pennsylvania tend to be located in narrow gorges. While the reasons for this placement seem relatively obvious (adequate supplies of wood and water power), the fact that many of them have their wheel pits cut into solid rock suggests another dimension. Obviously, so large an investment was for a purpose.

The above questions are based on rather casual observation and cannot possibly be answered without some sort of vigorous methodology that includes both an analysis of the available written documents as well as the artifacts, structures, and sites themselves. This latter analysis will only be effective if it deals in the discrete attributes of objects. Once object structures or sites are broken down to the smallest meaningful units or attributes, it may be possible to show relationships between different wholes through the use of various statistical procedures. In at least some instances historical data may be analyzed along with observational data to provide a more meaningful picture. In all such endeavors the skill and perception of the investigator will greatly affect the outcome.

Up to this point industrial archeology has at best taken a humanistic approach to knowledge. There has been a fair amount of information gathered over the last few years, but lacking a common methodology or even a good model of what can be done using a "scientific" method, it is unlikely that the field can progress past technical antiquarianism. Archeology in general tends to be revolutionized every few years by a paper that sets out a new methodology and takes it to its theoretical limit. Most often this is done by simply developing a more vigorous analysis which produces the data to prove some insight on the part of the investigators. Recently, architectural history has been similarly revolutionized by the publishing of Henry Glassie's work on venacular housing in Virgina. His methodology rests primarly on the statistical work of anthropologists and linguists and makes a significant contribution to the understanding of a cultural process. Industrial archeology desperately needs such a paper.

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3 ARCHEOLOGICAL EVIDENCE AND THE STUDY OF HISTORICAL INDUSTRY

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The purpose of this brief essay is to explore the nature of archeological evidence and the part it plays in the study of industrial history. The ideas and concepts expressed in the following pages were developed through one and a half decades of fieldwork, reading, and discussion and are intended to stimulate further reflection rather than to serve as any sort of general rule. Industrial archeologists today find themselves in a position somewhat analogous to the early archeologists who searched for works of art, not the physical remains of culture. Like our predecessors, we sometimes concentrate on the spectacular machine or site to "illustrate"[1] what we have learned from documentary sources, rather than struggle to discover exactly what it is that we can or cannot learn from material cuture about the industrial past.

Archeology is defined as "The scientific study of the material remains of past human life and past human activities."[2] This definition establishes that artifacts are the primary source of archeological knowledge and it draws no arbitrary distinction between objects found above or beneath the ground. Industrial archeology, then, can be interpreted as the scientific study of the material remains of past human industrial life and activities, regardless of whether the physical materials are standing intact on their original site or lying buried in ruins. Thus, the primary concern of industrial archeology is with the material culture of industry in the past as a unique source of information about human behavior.

Although there are expressions of human life and activities that can be studied with equal facility from either material or documentary sources, some behavior is better preserved in physical form than written form and vice-versa. Thus, industrial archeology can provide a resource for the inspection of those portions of the industrial past that survive exclusively in physical form and are not observable through the window of history.

The methods for recording and collecting artifacts are relatively straightforward but complex parts of the archeological method. It is not so simple, however, for historians and archeologists to agree on how artifacts can be used to study the past. We must develop a better understanding of proper and effective use of physical remains as sources of archeological information, for there are limits to what can be learned from material culture. A careful study of quill pens cannot help write political history, nor can machines inform us of the social concerns of their operators or the religious convictions of their inventors.

The classic and orthodox statement of the limitations of physical evidence was formulated in 1954 by Christopher Hawkes.[3] His ideas were developed further in the following decade by F.T. Wainwright. Hawkes and Wainwright separated archeological evidence into the following four categories which can be applied to the study of human behavior only with increasing difficulty. First, the artifacts themselves can speak to us directly about the techniques and the sequence of operations employed in their manufacture. They also can exhibit evidence of the technical skill and aesthetic concerns of the individuals who produced them. Second, economic activity and economies can be studied through physical remains but inferences from artifacts to these aspects of culture are not as direct as in the first category and involve a greater degree of assumption. Answers to economic questions asked of material culture are not always implicit in the objects themselves but must be derived occasionally from additional evidence. Third, inference and assumption can be extended further to address social and political issues. Great care must be exercised here, however, for these parts of culture are extremely difficult to study from artifactual evidence. And, fourth, the intellectual and ideological aspects of human behavior are the most difficult to learn about from physical remains.[4]

A particularly important part of the work of industrial archeology is to identify and study the areas of industrial activity that survive in physical form only. Today, the diffusion of technical knowledge is facilitated by specialized publications and formal classroom teaching. These diffusion mechanisms were not as organized or as effective in the early decades of the 19th century. Instead, engineers and mechanics learned their trades on the job in factories and machine shops by direct experience and word-of-mouth. Information moved from person to person by verbal rather than written means. For this reason, many of the principles and practices of machine building or the reasons for the use of particular materials for particular applications were never recorded on paper. The great inventions and ideas received some attention in the nascent technical press, but few documents can be found that help interpret commonplace and everyday mechanisms and procedures. The only record of many of the activities and products of the early millwrights and machinists is in the artifacts they left behind; once they are lost, part of the record of industrial culture is gone--completely and irrevocably.

The first machine tool, for example, to find common use in America's shops and factories was the turning lathe. With the invention of the slide rest and the power feed the self-guided cutting tool of the lathe could turn, bore, and thread metal or wooden parts with great precision. Single-handedly, the lathe caused a revolution in the way in which machinery was conceived and constructed yet almost nothing was written about the operation of these early machines nor their similarities and differences. Such a lathe removed from the Crown and Eagle Mills of North Uxbridge, Massachusetts, is now in the collections of Old Sturbridge Village. Machines of the same era and similar type are preserved by the National Museum of History and Technology, the Slater Mill Historic Site, and the American Precision Museum. Since the construction of spindle bearings, the evolution of advance mechanisms, and the provision for holding cutting tools are not described in any detail in written form, these topics can be studied only by observing the machines themselves.

It is not possible for the few early lathes that are preserved in museum collections to tell us how widespread or how common the use of the machines was. If the number of surviving lathes were greater, or if even more were known about the original location and function of the preserved machines, questions about use and typicality could be addressed more easily by archeological evidence. The lack of material

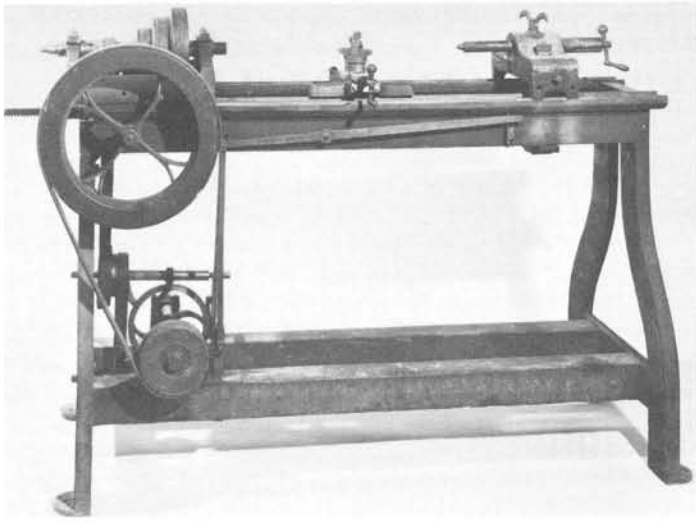

Figure 1. Turning lathe from the Crown & Eagle Mills, North Uxbridge, Massachusetts, c1840. Old Sturbridge Village photograph by Henry E. Peach.

evidence relating to economic activity in this case can be partially compensated for by the consideration of written evidence which can make some contribution to understanding early lathes in their contemporary environment.

The Phoenix Mill, a small stone cotton factory containing about 900 spindles, was built in the town of Ashford, Connecticut in 1823 as the second mill in a company-owned textile manufacturing village. Neither the early machinery nor the company papers is known to have survived. But, historical evidence in the form of local history and land and probate records is available for study. Such records often contain inventories listing the equipment owned by companies and individuals, although finding them can be tedious and difficult work, to assure the fair disposition of assets in the event of the sale of property or death of its owner. These records are particularly good in the case of the Phoenix Mill, for a bankruptcy deed of 1830, a mortgage deed of 1840, an execution to recover debt of 1844, and an inventory of personal estate of 1852, list machinery in the factory, including three lathes described as a cutting engine and two turning lathes. Thus, the presence of lathes in a particular location at specific moments in time is confirmed by the documents. Similar records demonstrate that other mills were similarly equipped and a pattern emerges from the historical documents that is useful to interpreting the machinery and work of early textile factories

The written sources, however, cannot determine that the three machines listed in the 1830 deed are the same as the one included in the 1852 probate inventory. Neither, except in a general way, can the documents suggest what tasks each lathe was capable of performing. Thus, the written evidence relating to the lathes provided us with economic information about quantity, location, and chronology but very little technological information about shape, materials, and operation. Referring back to the earlier discussion of the actual machines, the artifacts cannot supply easily the kind of economic evidence preserved in the land and probate records (quantity, location, and chronology) but can provide technological evidence not available in the documents (shape, materials, and operation).

If any of the lathes preserved in museum collections were found in the Phoenix Mill, integrating the archeological and historical evidence would not present problems. No direct physical information about the particular type of machines used in the Phoenix Mill is available, however, so scholars are forced to infer from sparse physical evidence gathered elsewhere in order to interpret the site; this can be done but assumptions must be made in order to integrate the archeological and historical evidence. The lack of back-gearing and an adjustable longitudinal feed on the lathe from the Crown and Eagle Mills indicates that the machine was used for light turning jobs, perhaps for wooden parts. The steep clearance angles ground into the tool-bit clamped in the toolpost also suggests that the machine was employed for wood turning. One of the turning lathes (excluding the engine lathe) listed on the inventories of the Phoenix Mill may have been very similar to this machine. As part of the equipment of the factory, a lathe of this type would have been employed to manufacture and repair wooden rollers and bobbins for textile machines.

The integration of archeological and historical evidence is simplified for industrial sites that still have their original equipment. An extremely rare example of a cast iron shafting system for transmitting power from the waterwheel in the basement to the machinery on the two floors above is still in place in the Gillette Grist Mill, located in New Hartford, Connecticut. In the very early decades of the 19th century, cast iron shafting began to replace the earlier, wooden transmission equipment. Cast iron shafting, being made of brittle material, broke easily and was extremely arduous to

Figure 2. The Phoenix Mill, built in 1832, Ashford, Connecticut. Old Sturbridge Village photograph by J. Alan Brzys.

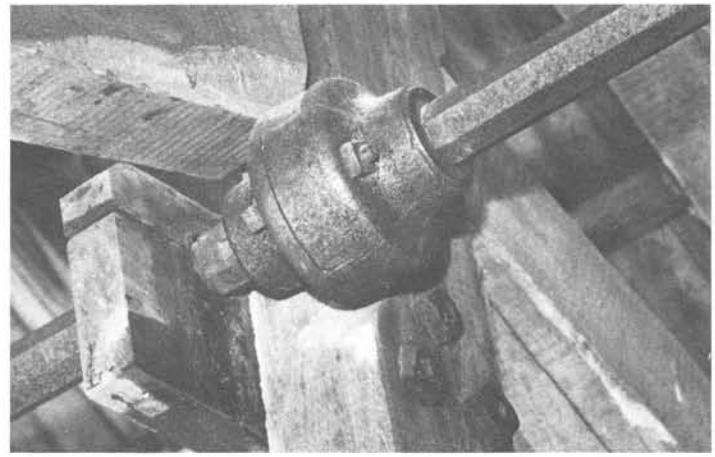

Figure 3. Cast-iron shafting and coupling in the Gillette Grist Mill, c1850. New Hartford, Connecticut. Photograph by author.

repair because the pulleys and gears were rigidly fastened in position by driving iron wedges between the polygonal shafts and the matching hubs. These pulleys and gears could be removed from a broken shaft and fixed on the replacement part only with great difficulty.

About 1840, American power transmission systems were improved again by the introduction of the English plan of substituting malleable wrought-iron shafting for its brittle cast-iron counterpart. Improved methods for fastening pulleys and gears to shafts and for connecting one shaft to another were adopted simultaneously. Cast iron power transmission equipment, which was widely used until that date, disappeared overnight. Today, only fragments of the old cast iron systems can be found. The Gillette Grist Mill provides the opportunity to observe a complete cast iron power transmission system. We can study the details of the casting and machining operations used to manufacture the shafting, the way in which connecting shafts were coupled together, and the bearings employed to support the equipment. This artifact-system preserves a wealth of technological information unavailable elsewhere. Public records similar to those cited for the Phoenix Mill can then be utilized to place the grist mill in its economic and sociological setting.

As Hawkes and Wainwright have suggested, artifacts are capable of supplyng economic information, but that is not the case in the example of the early turning lathe or the cast iron power transmission system. Little documentation is available to interpret and explain mechanical equipment found in the Phoenix Mill or the Gillette Grist Mill but, as described above, artifacts can supply that sort of technological information directly to take us beyond the point where the written record ends. Economic information, on the other hand, was available in written form for both mills but could not be recovered from the artifacts. Presently, not enough is known about the location, materials, and chronology of comparable physical objects to allow inferences about the economics of the artifacts discussed in the preceding pages to be drawn from the physical record.

Industrial archeologists face similar problems on both sides of the historical coin. To date, very little is known about the actual artifacts of early industry and how they evolved and diffused with time. Typologies exist for the potsherds and pipe stems of the historical archeologist, but not for the nuts and bolts, gears and bearings of the industrial archeologist. Also, American historians have not involved themselves in the sort of local history studies that are useful to interpreting industrial sites. They do not have the comparative information needed to make sense of the archeological or historical evidence for industrial archeology; lacking is a sense of context and pattern in what is observed. A sense of context and pattern will improve, however, as more descriptive studies of machines, sites, and other artifacts are undertaken and completed.

Context and pattern are essential concepts for both the archeologist and historian. Context signifies the concern for the relation of a bit of information to other adjacent bits of information that are not necessarily similar, but in close proximity to each other. Pattern signifies the concern for the relation of a bit of information to other similar bits of information that are not necessarily in close proximity to each other. Historians usually experience difficulty with material evidence for the same reason that archeologists have trouble with historical evidence: each asks questions of the unfamiliar evidence that it cannot answer properly.

Historians are vitally aware of the relationship of documentary evidence to context and pattern but do not hesitate to lift artifacts out of context or disregard pattern in the artifactual record. Archeologists, on the other hand, recognize the relationship of artifactual evidence to context and pattern but are quick to remove written evidence from context or disregard pattern in the documentary record. Our task, as industrial archeologists, is to interpret the material culture of industrial life and activity to learn everything we can about the human behavior embodied in those remains. We must struggle to understand what can and cannot be learned from documentary and physical evidence and search for ways to maximize our knowledge of past industry through the integration of historical and archeological information.

FOOTNOTES

1. Brooke Hindle, "How Much is a Piece of True Cross Worth," in Material Culture and the Study of American Life, ed. Ian M.G. Quimby (New York: W.W. Norton, forthcoming).

2. Webster's New International Dictionary of the English Language, 2d. ed., unabridged, S.V. "archaeology."

3. D.P. Dymond, Archaeology and History, a Plea for Reconciliation (London: Thames and Hudson, 1974), p. 43.

4. Christopher Hawkes, "Archeological Theory and Method, Some Suggestions from the Old World." American Anthropologist 56 (1954): 155-68; F.T. Wainwright, Archaeology and Placenames and History, an Essay on Problems of Coordination (London: Rutledge and Kegan Paul, 1962).

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4 THREE DIMENSIONS REDUCED TO TWO: USING MEASURED DRAWINGS AS A MEANS TO RECORD I A SITES

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There is no set formula to follow when producing measured drawings of industrial archeological sites, nor should there be.* The recording process is too complex to be reduced to a list of requisite site maps, plans, elevations, sections, and details. And it is too complex to be reduced to the sophomoric tenet that you "draw it as it exists." Different industrial or structural types demand different

treatments, and even structures of the same type often require individualized attention. Surely two locomotive erecting shops should not be drawn in the same fashion, if one is in ruins, while the other is intact and filled with original machinery.

Although a recording team cannot be sent out into the field with a set formula to follow, it can be provided with an over-riding rationale for its work and with a certain modus operandi. Armed with these, and with their own graphic, detective, and research skills, team members should produce drawings that are informative, accurate, and useful.

Rationalizing the recording process can be compared with the acquisition and preservation of technological artifacts as practiced by better museums. Above all else, an artifact is seen as a three-dimensional data source that informs of the culture that made it and used it. This information may be very diverse. Artifacts contain evidence of cultural styles and tastes, of the availability of materials, of manufacturing methods, of acquired scientific and technical knowledge, and of the ways of organizing and doing work. Because the artifact contains this information, it is valuable as a document of past human behavior, so it is acquired, preserved, and made accessible to the general public and to scholars.

IA sites also contain diverse cultural information and are therefore valuable as documents. But these sites and their attendant structures are generally fixed and immovable. If they are moved, it is usually not by the hands of a solicitous curator, but by a wrecking ball. A few IA sites will be physically preserved as museums unto themselves, and a number will be "preserved" through adaptive reuse.[1] But the vast majority of industrial and engineering structures will ultimately come down, and like Humpty-Dumpty, they will never to be put back together again.

Since the typical IA site cannot be shipped off to the Smithsonian, the Henry Ford Museum, or to Old Sturbridge Village, it is important to record it graphically. The recording of an industrial site can be seen as the functional equivalent of physically removing an artifact from the culture at large and sheltering it in a protected place, where it is to be kept in perpetuity. Drawings, like artifacts in a museum, store information. That is always a drawing's primary function--TO STORE INFORMATION.

In a sense, a drawing has two advantages over the real thing it represents. The site itself often stands like the door to the robbers' cave in Arabian Nights. It does not open to just anybody. The magic words must be known. Unless investigators have the experience and expertise to ask it the right questions, it provides too few answers. The abandoned factory complex does not broadcast the functions of its various buildings and their many compartments; it does not declare that the steam engine was added in 1885; or that a vertical boring mill once stood on a particular concrete pad; or that workpieces were finished as they moved up the building, rather than down.

The IA site--perhaps shut down, perhaps in ruins, or perhaps too complicated for the average viewer--may hide or camouflage all kinds of information. Through careful, probing research on the part of a recording team, this information can be retrived and brought forward. Drawings--with judiciously selected views, notes, symbols, keys, flow charts, and the like--can often impart information more readily than the site itself. So another function of measured drawings--besides storing information--is to make a site or structure more understandable: THE DRAWINGS ARE INTERPRETIVE TOOLS.

The second advantage that drawings have over the real thing is their reproducibility. They can be copied and easily transported to anyone who has any interest in them. This advantage is often overlooked, or even disparaged. Some people see no reason, for example, to graphically record an IA site that has been stablized, restored, or turned into a museum. But the fact remains that the site, in all its glory, stays put and is therefore inaccessible to most because of considerations of time, money, and distance. Drawings can spread knowledge of a site further and faster than the practice of visitation. Also, the site that appears so well protected today could be gone tomorrow. Present protection is no guarantee of long-term survival.

Having recognized two advantages of measured drawings, their limitations must be discussed vis-à-vis the real thing, photographs, and the written word.

The real thing can be a veritable treasure trove of information, containing an infinite amount of data. It can be revisited again and again, each time to investigate a new turn or twist. Both major and minor questions can be asked of it, and if skilled enough in historical research and in reading material culture, investigators can get the answers.

The first trip through an intact 19th century machine shop might be to examine its structural components--the brick masonry, the wooden-block floor, the trussed roof, the windows, and the clerestory monitor. The next visit might be to study all the machine tools and the way in which they were driven. On subsequent trips, the tool room might be explored to discover how cutters and gages were stored to protect sharpened edges or precision surfaces. Yellowed sheets show how each machinist signed out for the tools he used. Later, the lathes might be compared to see if the carriages were gibbed or counterweighted to prevent tool chatter. Kicking over an old can whose bottom is caked with the residue of an evaporated mixture of spit and tobacco juice could reveal that at least one machinist was fastidious; he didn't foul the floor.

The shop has a feeling of space. It has texture, color, heat, light, odors, and sounds. It contains thousands of artifacts, ranging from drawersful of taps, dies, nuts, and bolts to large machine tools and a steam engine. These artifacts, taken together with the structure itself, compose the shop's "visible" history--and it is impossible for drawings to capture all that history. For example, in the corner of a tool crib stands a cabinet that stores measuring and gaging tools. Within it are micrometers of varying size; inside, outside, and vernier calipers; ring, plug, limit, and thread gages; and steel rules. The cabinet has its own history, and so does each tool inside it. These artifacts are important resources for studying, if you will, "machine shop culture." Yet, a floor plan of the shop simply cannot cope with the complexities of this well-stocked, important cabinet. On the plan, it becomes, of necessity, a mere rectangle, perhaps a half-inch long and quarter-inch wide, labelled "Tool Cabinet." The real thing, in this instance, is infinitely superior to its graphic representation.

To complicate matters, there is an entire "invisible" history of the mill, one that cannot be perceived directly by a visitor. There are ghosts. Numerous historical agents--people, machines, and tools--are no longer there. They have long since vanished, and they cannot be resurrected solely by studying the shop's physical remains. The boiler room shows evidence of having been altered considerably, but it does not tell why. It does not tell that the alterations followed a boiler explosion in 1873 that killed two men. Many historical and economic questions that the industrial archeologist should ask of this shop simply cannot be answered by using material

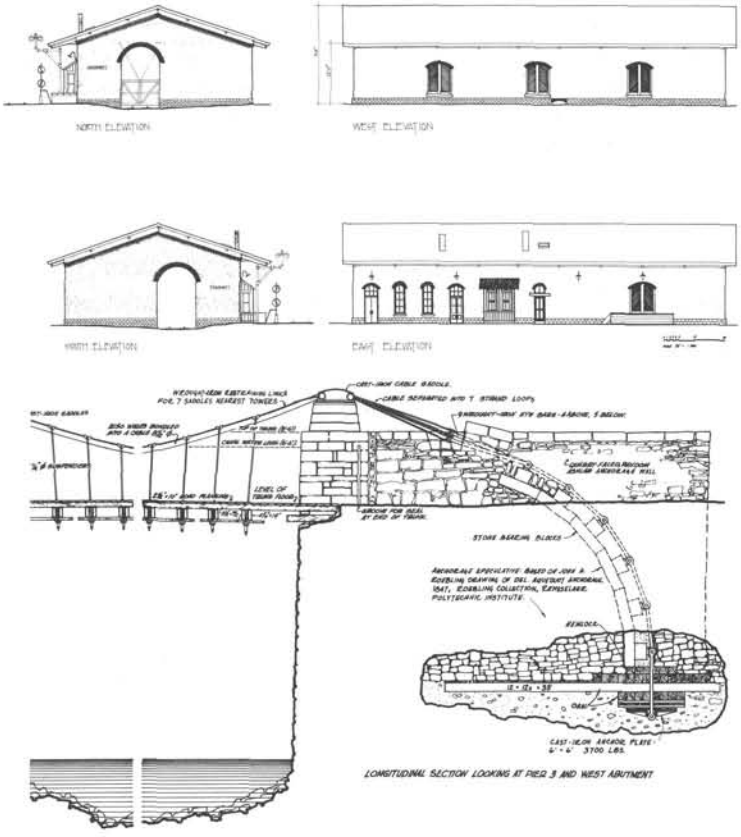
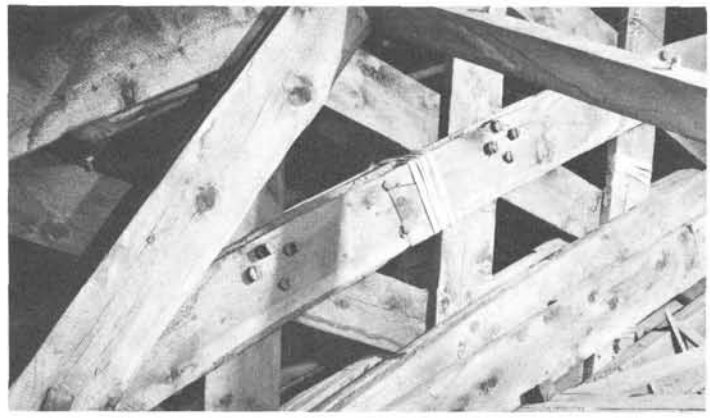


Figure 1. (top) Gosport (Indiana) Station exemplifies the "train barn" style of railroad architecture; one set of tracks passes through the station. Such a feature is best shown on a floor plan or perhaps a longitudinal section--either drawing would show more than could be captured with a camera. These elevations, however, are largely superfluous, because they store far less information than do photographs of the four sides of the station. For example, can you readily identify the various building materials? Can you find the wall anchors? Can you tell if the structure was built in a slip-shod manner or well-constructed? This sheet also typifies the strong aversion that many architects have towards "violating" elevations with any notes or keys. They like their elevations as pristine as possible. Consequently, elevations of historic engineering and industrial structures too often raise far more questions than they answer.



Figures 4 and 5. Working in cramped quarters in the dome of the Salt Lake City Tabernacle, a photographer cannot capture enough of the roof trussing to show the viewer how it really looks or works. For an overall view, a drawing is an absolute must. Still, the photograph complements the drawing showing us details. Note the circular-saw marks, the mortise-and-tenon construction, the iron fasteners, and the rawhide wrapped around split truss members.

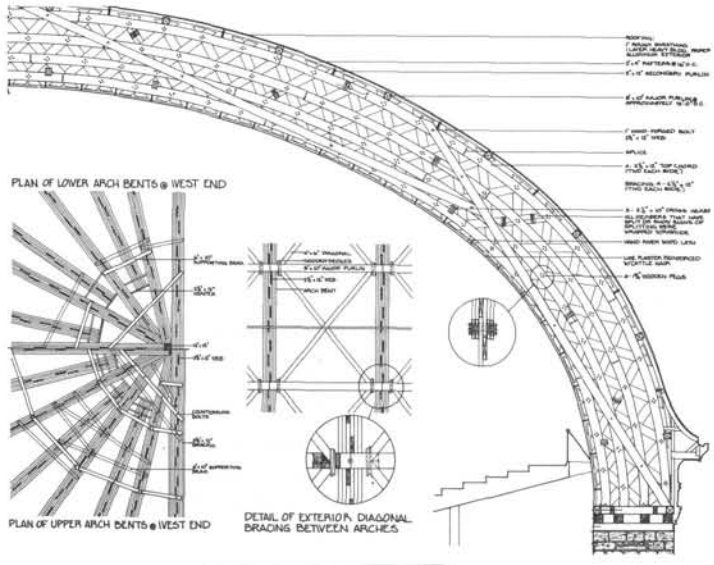
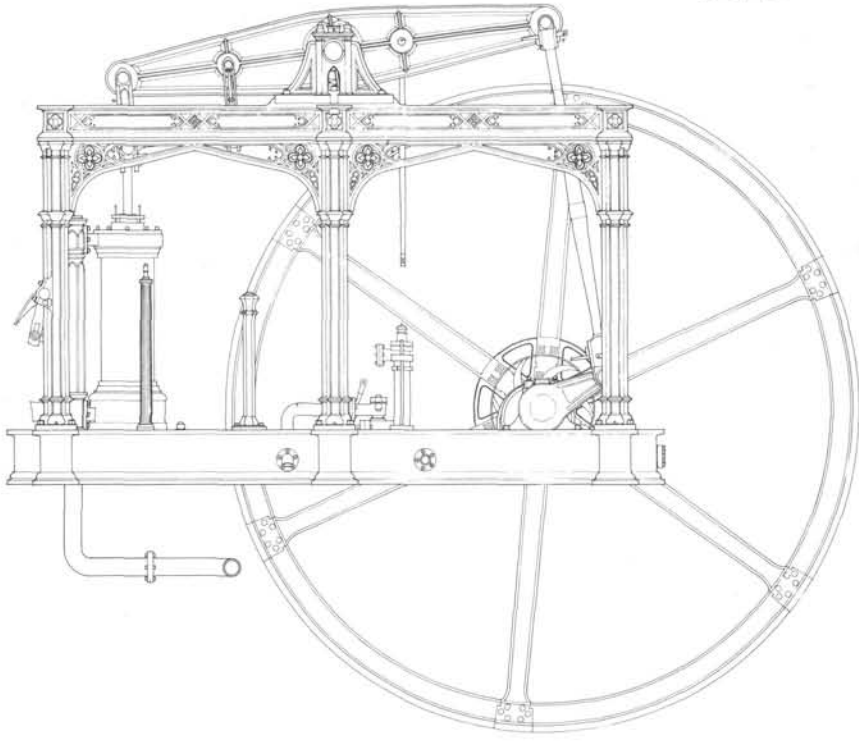


Figure 2. (above) This view illustrates the use of speculative drawings to "reconstruct" or "uncover" historic technology. As shown here, the buried anchorage of the Delaware Aqueduct was "uncovered" by historical research and a delineator's skill. The drawing makes heavy use of documentary information, permitting materials, dimensions and proper nomenclature to be shown.

Figure 3. (right) Obviously a skilled and delicate hand created this drawing of an 1861 West Point Foundry beam engine located in Puerto Rico. Here the delineator successfully combined "art" and "information." Still, the delineator (an architect) could have improved his drawing if he had been more familiar with machinery and the conventions of engineering (as opposed to architectural) drafting. By drawing only an "elevation" of the engine's "facade," he failed to take full advantage of the "magic" that drawings can perform. He could have shown us, for example, cross sections of the beam, flywheel rim, and spokes. He could have broken away part of the front of the engine bed to show us internal construction and piping. And--if he had had the heart to do so--he could have broken away the left side of the elaborate Gothic frame to expose the parallel motion, steam chest, and valves. Finally--and this is definitely a stylistic matter--he could have decided that a large, cast-iron engine called for heavier lines and a bolder approach. The drawing is light and airy. The engine most definitely is not.



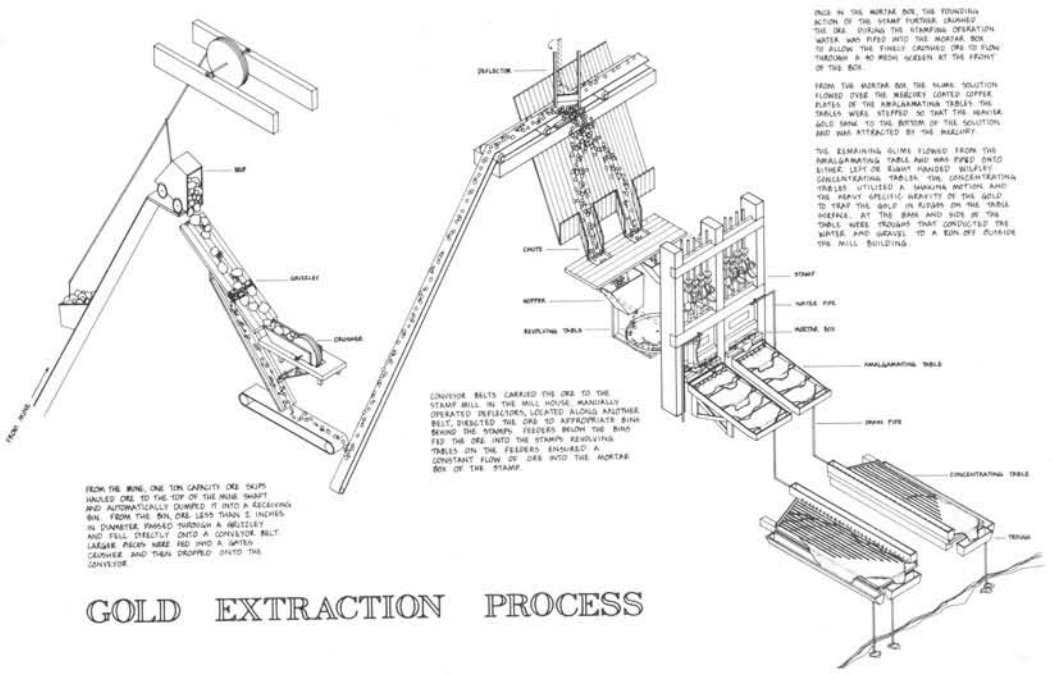


Figure 6. Plans, elevations, and sections of the Coggins Gold Mill simply cannot communicate, in a concise and readily understandable way, the processes carried out at this site. To record work (as opposed to design and construction), it often is necessary to reject standard architectural drawings in favor of interpretive flow charts. This flow chart is particularly good, because while documenting processes, it also succeeds in giving the user some idea of shapes, sizes and spatial relationships.

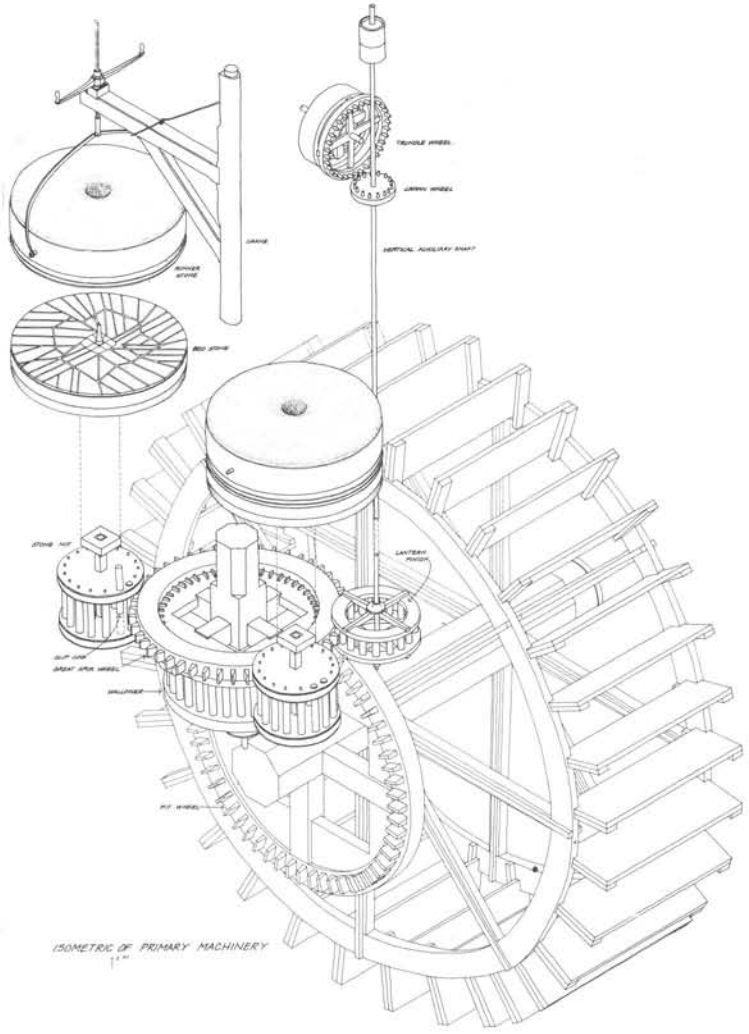
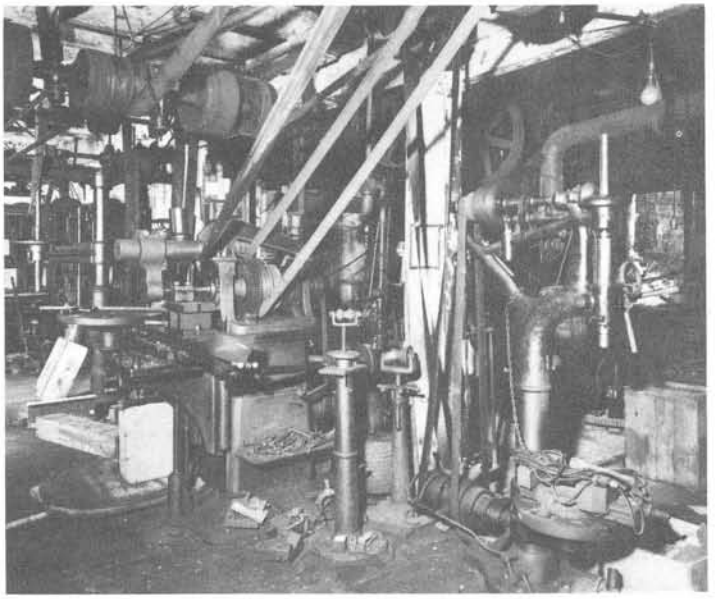


Figure 7. (left) This drawing performs "double magic." First, based on documentary and physical evidence, it reconstructs the missing undershot wheel and its pit wheel. Second, it peels away barriers (both floors and walls) to allow us to see a train of machinery and motion. Photographs of this mill could only show disconnected bits and pieces of the power and milling system.

Figure 8. (below) The Appomattox Iron Works could pass for the "hypothetical machine shop" discussed in the text. There is no way for drawings to capture all that can be seen in the shop. This view admirably illustrates the "inclusive" nature of photography. The purpose of this photograph was to record the horizontal milling machine and the drill press in the foreground. But these machines could not be isolated. They were captured on film in the context of all the material culture that surrounded them.



All drawings and photographs on these two pages are from Historic American Engineering Record recording projects.

culture. They can be answered only by researching other data sources, such as the written record. The shop itself will not tell who worked there, and whether they were content, well-paid, and well-fed, or whether they were rebellious, exploited, and hungry. This type of historical information--that cannot be gotten from the site itself--certainly cannot be stored by any line drawings representative of the site.

Drawings take considerable time and money to produce. Consequently, it is rare for a single structure to be documented by more than 10 sheets of drawings. But how, in 10 sheets or less, can you best cover the complexities of a structure such as our hypothetical machine shop? It is best to dispense with the idea of simply "drawing what's there." Due to necessity, and often due to chioce, a great deal will have to be left out. The drawings, as illustrated by the case of the tool cabinet, will never capture everything. The graphic record must be fleshed out with photograhs, and this graphic record must also be supplemented by a strong written report.

Photographs--both historic and modern--have several advantages over drawings. For members of our modern "Kodak culture," who are more familiar with cameras than with drafting tools, photographs are generally much easier to read and understand. Photographs often convey a sense of human-scaled space better than dimensioned floor plans, and they will certainly capture textures and materials better than any line drawings. Photographs are much less expensive to produce, so they are usually the best way of documenting numerous architectural or mechanical details. Also, photographs are more comprehensive, more inclusive. A delineator starts with a blank sheet, and the finished drawing stores only the data consciously inked onto it. The photographer, on the other hand, shooting the interior or exterior of a structure, may focus on a particular feature, but more often than not, the film will also capture the images of surrounding features and background details. A photograph, in short, may show us more than its originator intended, while a drawing seldom does.

Photographs, too, have their limitations. It is the camera, more than the drawing, that records a site, for better or for worse, "as it is." The photographer is stymied by the underbrush, trees, and walls that block their line of sight. No filter can make all obstructions disappear. No photographer can use their camera to take a machine or structure apart. Nor can they use it to put together pieces of a machine or structure that were separated long ago, and which are found at a site in a jumbled pile.

Drawings, in contrast to more reality-bound photographs, can perform magic. That is their strength, and it must be exploited more and more. Delineators are tied to the physical characteristics of a site, and are not allowed to fantasize. Yet they can creatively warp reality. They can make a wall disappear to show us what is behind it; cut any structure in half, horizontally or vertically; explode an assembly, to show us important pieces; take the parts of a demolished or disassembled mechanism and reconstruct it as a whole; take a complex manufacturing process and its attendant machinery, and reduce it to a readily understandable flow chart; and when confronted by barriers that block accesss to the internal parts of a machine, they can nevertheless represent those parts and their motions schematically.

But in a real sense, the success of the drawings meant to represent a three-dimensional site is determined long before any ink hits mylar. It is determined even before the recording team pulls out its 100-foot tape and begins taking field measurements. Before the tape and field notebooks are brought out, the delineators and historical researchers should go over the site or structure carefully, looking into all its nooks and crannies. They have to be inquisitive and adventuresome. They have to ask questions of everything they see. They must read the site; identify artifacts and structural parts; follow processes; and be cognizant of changes that may have occurred over time. When confronted by a puzzle--something they do not understand at first--they have to meet it head on. Only in this manner can they truly come to understand a site. And only if they understand a site, can they draw it properly.

Once a recording team has done its on-site homework, and once the researchers have shared their expertise and the fruits of their investigations into other data sources, then the team is ready to decide what is truly important about the site-- what information should be stored, interpreted, and analyzed. Once this judgement is made, then the team can decide what aspects of the site should be treated in the historical monograph; what parts should be recorded photographically; and what parts and processes would be best illustrated by drawings.

If the site or structure truly merits it, and if time and money are available for it, then a recording team may decide to do a full set of drawings. Such a set might include: a site location map; a site plan; floor plans; elevations; longitudinal and transverse sections; details; isometrics; process and flow charts; and schematics. In many cases, however, the idea of doing such a comprehensive "set" of drawings should be dispensed with, in lieu of choosing just those individual drawings that are deemed most useful. Industrial archeology is not just the architectural history of industrial buildings. It goes beyond that. The industrial archeologist may be interested in a structure whose architecture or building technology is literally "run-of-the-mill." They may be interested only in the people, machines, tools, and processes that operated within the structure. In such a case, it would be extravagant to record the structure's architecture with numerous drawings, when far less expensive photographs would serve just as well to document facades and the like.

When a field team has decided upon those views that will best show the site--on those views that will contribute the most to our knowledge and understanding of the site--then they can pull out the 100-foot tape and begin taking field measurements and notes. Adherence to this regimen will never guarantee success, but it will help minimize failure and disappointment. The drawings produced by the most skilled and experienced field teams will never show everything to be seen at the site itself. But they should show, in a clear and bold way, what the field team members, intimate with the site, deemed its most significant features.

FOOTNOTES

*Editor's Note: While Lankton's paper was prepared for the Symposium, unfortunately he was unable to attend to take part in the discussions. See papers by Newell, Brown, Penn, and Packard for a different view of the need to formulate questions to ask of physical remains, and the use of inference in interpreting physical data.

1. Adaptive reuse is an aid to preserving a built environment that is visually diverse, and it may well serve as an economic stimulus to a community. But it is far less successful in terms of preserving the cultural evidence to be found at any IA site. The boutique-laden roundhouse and the train station-restaurant are uncomfortably reminiscent of the surveyor's transit and duck decoy that have become the bases of lamps in someone's living room.

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5 INDIRECT METHODS IN INDUSTRIAL ARCHEOLOGY

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The fundamental argument of archeological method is inference. In inferential arguments, conclusions about non-observable past behavior are deduced from observable archeological remains. The argument may be outlined as follows:

If X is present, then Y is (was) present.
X is present.
Y is (was) present.

In prehistoric archeology this argument may appear as follows:

If arrowheads are present in site X, then
hunting was present.
Arrowheads are present.
Hunting occured at site X.

The relationship between arrowheads and hunting is well established in ethnographic literature, and as an analogy it forms the assumption upon which further argument is based. The conclusion that hunting occurs at site X permits prehistorians to compare and contrast site X with other sites in order to establish generalizations about the distribution of hunting activities through time and space.

In general, inference is not as powerful an argument in industrial archeology as in prehistory. Past patterns of industrial behavior are frequently so well documented that inferring them from archeological evidence may be redundant. We do not need, for example, the presence of a train depot to establish the existence of trains in 19th century Chattanooga. The application of inference to the obvious is simply game playing, though it is an approach apparently advocated by some archeologists.

> As archaeologists we must depend on our archaeological tools for our interpretive statements of archaeological data, and not resort to the easy expedient of superimposing our historical data onto the archaeological record. In our final interpretive statements we do, of course, use both the archaeological and the historical data, but we should not use the documented history of the site as an interpretive crutch to prop up our statements purporting to be archaeological in nature. If we develop such habits, and then find ourselves in a situation where there is no documentation to lean on, we may well find that our archaeological tool kit is empty, or that we do not know how to use the tools we have available with which to make interpretive statements of archaeological data. Such a leaning-on-the-arms-of-history approach to historical archaeology is rendering a disservice to archaeology by not utilizing to the fullest the patterned data it is capable of producing.[1]

Historical records of the recent past are so voluminous they are frequently an embarassment to archeological approaches. Yet, historical documents do not describe all past events with equal detail or reliability. The documentary record is generally incomplete and contradictory. It may, as well, be inconsistent with the archeological record.

When contradictions between archeological and historical documents are discovered, archeologists generally seek to determine the "true" reconstruction of the past. Anthropologically-trained archeologists, however, should be aware that contradictions and inconsistencies are basic attributes of human thought and behavior. Differences between real events and ideal standards provide opportunities to explain complex levels of human behavior and even to explore the hazardous ground of human motivation.

The anthropological study of human cultural contradictions is generally known as dialectical anthropology.[2] The archeological application of the dialectical approach might be termed "indirect methods." Indirect methods differ from the usual direct, inferential-reconstructive methods by their focus upon the discovery and explanation of inconsistencies among various documentary and archeological data. Indirect methods do not simply attempt to infer behavior directly from material remains, but instead seek to understand past behavior indirectly through comparison of archeological and historic data. These methods assume that the historical documentation of past events is incomplete and often reflects ideal patterns of behavior rather than real events. As archeological remains provide physical evidence of actual past events, archeological data can be used to discover inconsistencies between behavioral realities and documented idealizations. Once these inconsistencies have been discovered, anthropological models can be offered as explanation.[3]

A simple, readily available subject for indirect archeological study is the relationship between ideal building construction standards and actual construction practices. Ideal statements of past construction standards may be obtained from the literature. Actual historic construction practices can be observed in the field. In the summer of 1977, the University of Tennessee at Chattanooga archeological field school was conducted at the unlikely but convenient location of the University quadrangle, where the ruins of the first campus building lie buried. This first university structure, unimaginatively know as "Old Main," was built in 1886 and torn down in 1917. It was for the place and period a massive building five stories in height and containing 80 rooms.[4]

Archeological excavations were undertaken at Old Main with the expressed problem-orientation of determining if the ideal standards of the period, as outlined by Baker and Rankine,[5] had been followed in construction of the Old Main foundations. Investigations of the stone foundation revealed construction that was inadequate according to the standards of these 19th century authors. Specific indications of sub-standard work include the frequent use of spalls in horizontal joints, the excessive use of mortar in joints and wall interiors, the presence of side joints located immediately above each other in successive courses, and general uneveness of construction. Not only does the foundation provide evidence of indifferent workmanship, but almost all recovered bricks are also defective. The corners and sides of most are misshapen and cracked due to the presence of air pockets not removed during extrusion from the pug mill. Many bricks are over-fired to the point of severe vitrifiction and sub-surface boiling. A number of explanations can be offered for the substandard building practices apparent at the Old Main site. Potential explanations currently being investigated include the possibility of inadequate funding, disruption of the organization of the skilled building trades in the post-Civil War period, and mendacity of the contractor.

Obviously, comparative efforts are required before the study of sub-standard building practices can be approached scientifically. The investigations at Old Main, however, demonstrate that qualitative data regarding actual construction practices can be easily obtained and contrasted with contemporary construction standards in order to generate potential explanations of anthropoligical interest.

A second example of indirect methods is also drawn from the Chattanooga area and concerns the "Bluff Furnace," the first

coke-fired blast furnace in the southern Appalachian region. A brief history of this operation is outlined below.

> Since the close of the Civil War Chattanooga has become the most prominent iron center in Tennessee, having several iron enterprises of its own and others in its vicinity. Prior to the war, in 1854, Bluff furnace had been built by Robert Cravens, James A. Whiteside and James P. Boyce, to use charcoal. In 1859 the limestone stack was torn down by the East Tennessee Iron Company, of which James Henerson, of New York, was the manager, and a new iron cupola stack, 11 feet wide at the boshes, was erected in its place, and Racoon coke was thereafter used as fuel. The new furnace was blown in May, 1860, but owing to a short supply of coke the blast lasted only long enough to permit the production of about 500 tons of pig iron. All the machinery and appointments of the furnace worked satisfactorily. The furnace was started on a second blast on the 6th of November, the day of the Presidential election, but political complications and the demoralized state of the furnace workmen were obstacles too great to be overcome, and the furnace soon chilled from the cause last mentioned. The stack of the furnace at Chattanooga was used by the Union troops as a lime kiln, by whom it was subsequently torn down. This was the first coke furnace in either of the States of Tennessee or Alabama, which are now the theatre of such great present and prospective activity in the manufacture of pig iron with this fuel.[6]

Figure 1. Engraving of Bluff Furnace, 1858.

The development of the post-Civil War pig iron industry of the Chattanooga area was largely due to the efforts of ex-Union Army officers who recognized the industrial potential of the East Tennessee region during their military tours of duty. These individuals were, in the parlance of the day, "carpetbaggers" and they had little sympathy for the traditions and accomplishments of the ante-bellum South. It is not surprising, therefore, that they would re-write the industrial history of that region for their own purposes and would minimize the role of the Bluff Furnace. An example of their handiwork is quoted below:

> With the exception of a very diminitive effort, no attempt was made in the South previous to 1868, to use coal or coke in iron smelting. That effort was by a gentleman named Churchill, and his furnace stood under the river bluff east of the foot of Market Street in this city. It was a trifling affair, made a few tons of iron, was chilled and with the war coming on was abandoned....The money and energy were a clear loss, as they demonstrated no possibility of our coal as an efficient fuel, nor our fossiliferous ores as fit material for making good iron. No notice of this was taken either as a failure or success in any respect, by the real pioneers in the Coke Iron business in the South.[7]

Col. J. E. McGowan, author of this quotation, was editor of the Chattanooga Times.[8] He was an ex-Union officer, and he promoted as the true founder of the local iron industry the Union military hero and industrialist, John T. Wilder. It is unlikely that Wilder was unaware of the Bluff Furnace as he camped with his men immediately across the Tennessee River from it during their 15 day bombardment of Chattanooga. The site is clearly shown on a map drawn by one of his men.[9]

Through recent exploratory archeological work, the extent and major characteristics of the Bluff Furnace have been mapped and described.[10] It has been possible, as a result, to clearly identify a previously unrecognized 1860 photograph of the furnace in operation. These investigations indicate that the furnace plant occupied an area approximately 180 feet by 150 feet. The massive stone walls of the casting shed were three feet thick, not including footings. A blowing engine was apparently present, as was a heat-exchanger or hot-blast device. The Bluff Furnace, then, was not the "diminutive effort" or a "trifling affair" that McGowan would have readers believe.

Mythology, in the anthropological sense, deals with the establishment of opposition. The post-Civil War industrialists contrasted the greatness of their accomplishments with the supposed primitiveness of their predecessors. Technological myths often contrast supposed present greatness with an imagined primitive past.

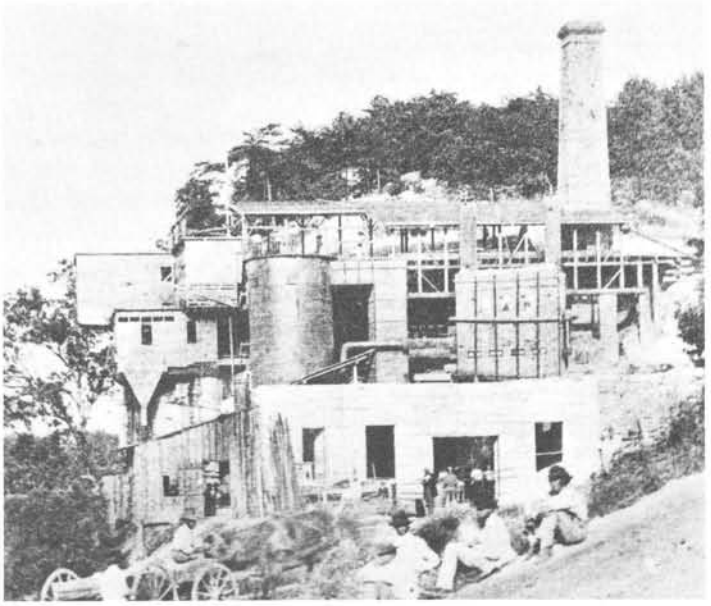

Figure 2. Photograph of Bluff Furnace, 1860.

The opposite, however, may also occur. The shabbiness of contemporary creations may be contrasted with the assumed master craftsmanship of the past. Industrial archeologists, therefore, through indirect methods, can be seekers of industrial myths, as well as discoverers of industrial facts.

Indirect methods, in summary, are approaches that compare and contrast archeological realities with historic documents for the purpose of discovering cultural contradictions. Such approaches are not limited to archeological or historical data, but are truly interdisciplinary. The burdens imposed by these methods are severe. Sampling problems, the bane of both archeologists and historians, are magnified as archeological and historical data are brought into conjunction. Levels of abstraction must be clarified and the role of fortuitous discovery minimized so that indirect investigations do not assume the character of unrelated anecdotes.

If indirect methods are to succeed, it is imperative that investigator bias be minimized. Industrial sites must be recorded with the highest degree of accuracy that is possible. Idealization in the recording of sites for simplification or preservation purposes must be avoided so that archeological realities may be compared with historically documented ideal standards.

The goals of indirect methods are, in the end, comparative. It is hoped that these methods will produce data about cultural

contradictions that are truly comparable and that comparisons can be conducted both through time and across space.

FOOTNOTES

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8 Charles D. McGuffey, Standard History of Chattanooga, Tennessee (Knoxville: Knoxville Printing and Box Company, 1911).

9 John W. Rowell, Yankee Artillerymen (Knoxville: The University Press, 1975).

10 Jeffrey L. Brown, "Exploratory Archaeological Excavations at the Bluff Furnace Site" (Chattanooga: Institute of Archaeology, 1977).

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II

INDUSTRIAL ARCHEOLOGY AS A CULTURAL RESOURCE

6 INDUSTRIAL ARCHEOLOGY'S ROLE IN CULTURAL RESOURCE MANAGEMENT

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With the increasing flow of governmental funding from several legislative sources (Historic Sites Act of 1935, Historic Preservation Act of 1966, National Environmental Policy Act of 1969, Archeological and Historic Preservation Act of 1974 et seq.) field work in American archeology has gravitated towards cultural resource management; a bureaucratic term for the consideration, protection, and possible salvage of historic and prehistoric sites and structures in the path of oncoming federal projects. The importance of this phenomenon may be judged by the figures. Last year the majority of all funds for archeological field research in this country were spent under the aegis of cultural resource management.[1]

The treatment of archeology as the management of a national resource has been a source of concern for traditional archeologists. They view the legislatively sponsored work as a possible threat to archeology as an academic discipline. The fluorescent archeological contracting firms and free lance shovels, the narrow orientation of some resource surveys, and the necessity of applying federal standards of significance all contribute to this feeling of unease. Problems caused by the boom town attitude toward the field are sweetened by the undoubted benefits of a high level of funding and diversified research on a regional scale. These undoubted benefits apply doubly for a developing discipline like industrial archeology. The cultural resource management approach is one route to money, support, and recognition. Edward and Mary Jane Rutch's work in Paterson New Jersey and the surveys of the Historic American Engineering Record are notable examples of federally funded industrial archeology.

This paper raises a few issues for industrial archeologists to consider as they seek their fortune in cultural resource management. One must start with a belief in the product. It is necessary to assume merit in treating America's industrial past as a valuable cultural resource which logically should be considered after a study of the prehistory and early history of a region. The first level on which the industrial archeologist needs to deal with cultural resource management is that of public relations. The general citizenry and bureaucracy is unaware of the existence of industrial archeology as a field of study. Even with the growing sensitivity to the value of

preserving the past, old houses and arrow points have a more marketable quality than the average industrial site or structure.

Industrial archeology as a new field has only a small group looking out for its interests in the planning of new federal projects. Although this is gradually changing, industrial archeology has even made the front page of the Wall Street Journal[2] , more public education about the subject is a necessary first step. Generating public interest is particularly important, because our industrial past is disappearing faster than any other cultural resource. Robert Vogel summed up some of the factors that have hastened the obliteration of industrial resources in A Report of the Mohawk-Hudson Area Survey; ". . . unattractive surroundings, poor conditions due to lack of maintenance during the final years of use or long abandonment; and in the case of buildings, normally a size too great or a layout too specialized for most adaptive uses."[3] He also points to the unsavory psychological element connected with industrial areas. The fact that factories are associated with noise, dirt, and human exploitation retards the recognition of their informational content.

For years industrial sites have not been considered a protectable entity under national legislation. This attitude must be changed if the industrial archeologist is to participate to a wider extent in cultural resource management. A little judicious lobbying could be most helpful. A ready example is the promotion that industrial archeology gets in the folder describing the services of the "Interagency Archeological Program."[4]

If a lack of public recognition is a problem, a lack of cohesive principles making up the field is a more fundamental problem. At least traditional archeologists and historians have a developed body of theory and information to apply to the special problems of cultural resource management. Industrial archeology draws on the skills of a variety of established fields: history, economics, archeology, engineering, etc. Only a few practitioners have been able to manipulate the total complex of information. Until recently little thought has been given to establishing a theoretical base for the less creative to follow.

There has also been insufficent time to develop a broad data base or many examples of finished work in the field. In England, where industrial archeology has a longer history, many local groups have broken the back of the work by performing regional surveys that at least identify the remnant of industry in a given region. General works on various geographical areas of the United Kingdom have already been published.[5] Only a few broad based studies from which more specific work can be launched have been attempted in this country. The Report of the Mohawk-Hudson Area Survey[6] is an exception, one of the stated goals of the book is to give an overview of that important industrial area. The Historic American Engineering Record with 5,000 sites on file has done pioneering work. The survey has followed a regional approach; however, many sections of the country remain unexplored.

Industrial archeologists involved in a cultural resource study are challenged by the lack of even basic information on a particular area. After starting from scratch and identifying the industrial resources within the confines of the project, he or she still has only a telescopic view of the area. The industrial archeologist does have the advantage of proximity in time to the subject matter and in comparison to other archeologists a wealth of written material. The availibility of raw data and the lack of organized research only increases the importance of the work.

On a more practical level the lack of comparative data hampers industrial archeologists in performing their obligations under a cultural resource management study. The federally defined objective of these studies is the identification of sites and structures eligible for the National Register of Historic Places. While Register nominations may be prepared for sites of purely local interest, valid discrimination of rare industrial structures or processes from the commonplace is difficult without an understanding of comparable regional and national material. This problem can be overcome to the degree the field worker performs additional background exploration. The National Register criteria must be applied to the resources in each regional survey. This information is used for planning purposes and is the only data that by law need be attended to by a federal agency.

An even more fundamental problem is the next step of recommending a "final solution" for important industrial resources that will be adversely effected (i.e. destroyed or altered by federal action).[7] For a variety of good reasons industrial structures are difficult to reuse once their day is past and they rarely play a key role in maintaining the atmosphere of a neighborhood. More than other resources foresighted, organized destruction (with measured drawings, historical research, photographs etc.) may be an acceptable conclusion. Industrial sites that have been buried by neglect or purposeful action pose another problem. Often vast quantities of overburden must be removed to reach the original level and the stratigraphic accumulations of 20th century industrial areas can be staggering. The amount of information may be insignificant and available from other sources. The excavation of large industrial sites is not to be undertaken lightly.

This paper is only indirectly concerned with industrial archeology's contribution to the understanding of human culture. It simply discusses one method, cultural resource management, by which the discipline can increase the sum of its knowledge and poses a few issues that need to be considered in this area. As should be expected issues of public education and technique are easier to propose concrete solutions to than the more difficult question of formulating a theoretical basis for the field. While industrial archeology's catholic approach gives it great creative potential, a diversifid intellectual base is no replacement for its own unique goals and objectives. If the field does not approach cultural resource management with a clear understanding of itself, industrial archeology will find its only methodology grounded in federal laws and regulations.

Footnotes

1. Michael B. Schiffer, and John H. House, "Cultural Resource Management and Archeological Research, Cache Project." Current Anthropology 18 1977.

2. "Industrial Evolution, New Archeology Breed Seeks to Learn More of Manufacturing Past", Wall Street Journal, 26 June 1975.

3. Robert M. Vogel, ed., Smithsonian Publications in Technology, No. 1, 1973.

4. National Park Service, U.S. Department of the Interior.

5. For example, David Smith's book on the Industrial Archaeology of the East Midlands (Devon: David and Charles Ltd., 1965).

6. Vogel, ibid.

7. It is less likely that the intrusion of visual, audible or atmospheric elements will be out of character with an industrial site. See Advisory Council on Historic Preservation, Procedures for the protection of historic and cultural properties, 36 CFR 800.9, 1974.

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7 INDUSTRIAL ARCHEOLOGY IN ITALY: BIRTH AND PERSPECTIVES

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This is the first time that Italian scholars have spoken in this country about the field and, therefore, it is the first occasion that we have had to exchange ideas and experiences. Although Ornella Selvafolta and I represent the Italian Society for Industrial Archeology, we will express our personal points of view; there are many ideas and, consequently, much debate on the topic in our Society.

Before explaining the present and future programs of the I.S.I.A., it is important to discuss the birth of Industrial Archeology as an autonomous discipline in Italy. Three conditions are responsible for the rise of Industrial Archeology in my country. However, these, by themselves, did not generate its study. The first or "institutional" type of condition is connected directly with "Cultural Resources Management" which numerous public agencies and institutes practice at various levels in Italy. In fact, these activities are rather new here. What does Cultural Resources Management mean for us? It refers to all activities which improve knowledge, the diffusion of knowledge, and the safeguards, preservation, and the correct use of historical testimony. Until recently, only monuments, works of art, and archeological reports from what were considered the "essential" periods of art and architectural history were esteemed as historical documents worthy of being preserved. The new cultural point-of-view arose in the sixties and seventies as a response to events such as the crisis of "official culture" created by the student protests of 1968, the interest of groups such as the WWF, Italia Nostra, etc, in preservation of our historical heritage, the birth of the Ministry of Cultural Resources, and, last but not least, the creation of regional administrative organizations which took into account local situations. (I believe Brandel's thesis also had a great influence in this regard. F. Brandel, Civilisation materielle et capitalisme XV/XVIII siecle, Paris, 1967.) And thus the distinctions between more and less important arts and between the ruling culture's power to preserve and to ignore subordinate culture, and the contrast between the "singularity" of the monument and the surrounding man-made or natural environment are ideas which are no longer generally accepted. In brief, we have adopted an anthropological concept of culture and, as a consequence, the broadest notion of "cultural resources." At last, environments and objects connected with industrial production, machines, etc. are esteemed as cultural resources, as valid testimony of history and culture just as the work of art or the singular, rare, or representative monument.

The second condition which gave birth to Industrial Archeology in Italy is the intense urban conflict, which can be divided into two phases. Urban growth was very slow. Metropolitan areas were created in the fifties and sixties by the rapid industrial development which caused massive migrations from the countryside to the towns, from south to north.

At the end of the first phase, the urban structure was as follows: towns consisting of a central area utilized for housing, tertiary activities, commerce, the still-flourishing artisans, and a closed periphery with industries and immigrants', clerks', and workmens' houses. In the middle of the sixties, the economic powers rationalized industrial production. They moved factories beyond the periphery where, thanks to the large open spaces, they were able to build new factories and to up-date technology. But, at the same time, they had plans for central areas. These, free of old buildings, could be used for more lucrative ventures: commerce, business, and luxury apartments.

In the late sixties, the second phase was in the last stage of formulation. Many citizens from the lower classes had organized committees whose intent was to reclaim their "right" to the inner city, in other words, to economical housing, supported with state aid, in the central zones of the city where there are the most public and social services, such as schools, hospitals, transportation, etc. Furthermore, the lower classes were opposed to being dispersed in several districts, far from the vital center of the city, when the struggle between the unions, government, and industry was becoming intense.

The above means that, at first, the urban conflict centered exclusively on the housing problem. The citizen committees fought against institutions in order to obtain restorations of old places of

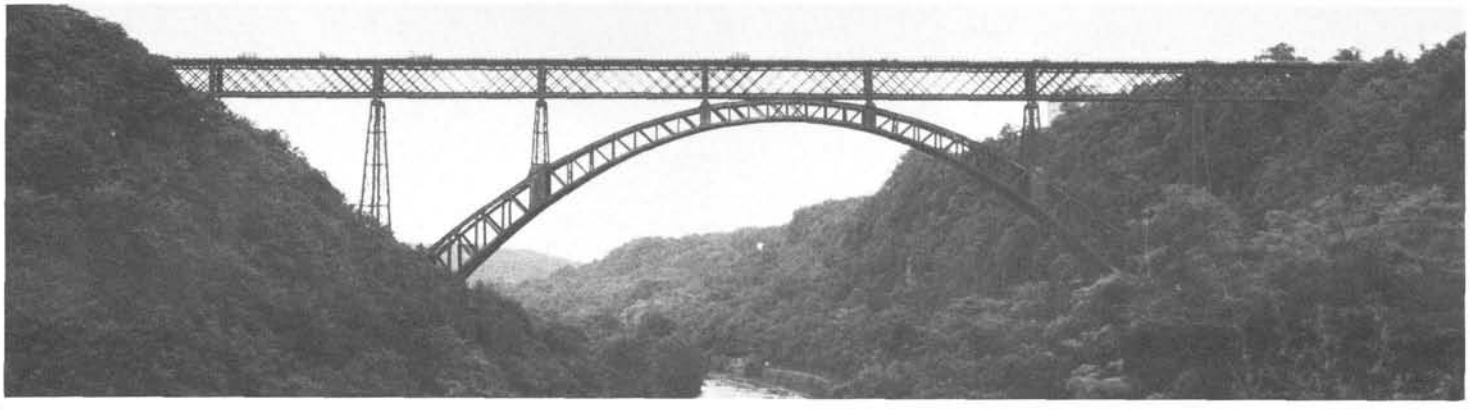

Figure 1. Bridge of Paderno d'Adda, a late nineteenth-century steel arch located near Milan. The upper deck carries highway traffic, the lower railway traffic. Photograph by D. Newell.

residence and against private owners of the buildings in order to prevent their transformation into offices and/or luxury apartments. Afterwards, in conjunction with the economic crisis and the ensuing development plan, the conflict was enlarged from the housing problem to include also the place of work. With the entrance of large industrial complexes into the crisis, the lower classes began to defend, not only for economic but also for physical reasons, their places of work. Examples of such struggles include those of the dockyard workers of the Giudecca, in Venice, to defend their place of work and nearby residences, and those of the population of the company-town of Crespi d'Adda, which recently was put up for sale. It should be emphasized that an economic claim becomes a cultural claim when it centers on the defense of historical structures and testimonies.

The third condition which lies at the base of Industrial Archeology was created by the cultural and scientific exigencies in the field of historical disciplines. The experience of several studies resulted in the need to recognize not only the written documents, but also to reconstruct the physical and environmental context of several phases or historical situations. As a result of extensive fieldwork, for example, research on the 18th century manufacturing center of San Leucio has brought to light a singular and stimulating social-urban experiment and the reconstruction of the Bourbons' vast plan to organize Southern Italy. This reconstruction overturns the negative historical opinion held up until now. Research is being conducted on the physical structures on the historic periphery of Milan. These studies sometimes centered on projects of urban renewal. And finally, research on the preservation of historical, industrial monuments is being undertaken in the United States by Italian scholars through Fulbright programs.

These, in brief, were the general "historical" conditions which brought about the creation of Industrial Archeology as a more up-to-date method of research, as an instrument of knowledge, and as a field for activity in the realm of "cultural resources" and the use of the historical patrimony of the city.

The natural consequence, first, was the foundation in Milan of the Center for Documentation and Research: Industrial Archeology, and then the I.S.I.A. with regional offices in Milan, Rome, Turin, and Padua. The Society and centers are formed by scholars who come from extremely diverse fields of study, from the history of art to folk art, from the history of architecture to restoration, etc. These scholars meet in order to share a common work experience. The varied background of the components of the work group gives industrial archeology research an interdisciplinary character. This does not mean to say "generality," but rather "a partnership of specialists." And this is another important characteristic of that which we can define as the Italian approach to Industrial Archeology.

The Society is a little more than a year old; in fact, it was founded in July 1976. In this first period, its activity has centered above all on instruction to produce researchers and on the study of the rapports with the state and regional agencies for "cultural resources," already mentioned. The research which has been done, both in universities and by autonomous groups stemming from the Society, had these objectives: the identification of the confines and of the historical precincts of the discipline and the discovery of the correct method of research.

From its beginning, the I.S.I.A. was otherwise engaged in a policy of denunciation of the state of abandonment and of the ruin of the archeological industrial patrimony and the continual process of destruction and degradation to which it is submitted. Several members of the Society have personally participated in the struggle for the conservation of monuments which were threatened with destruction.

At the end of the first year, a conference was organized in Milan; the aim was to take a census of the interests of Italian scholars and to compare our research with that, much more advanced, of foreign scholars.

The future programs of IA in Italy in the ambit of the activity of the I.S.I.A. can be summarized as follows:

1. To produce a catalogue of the industrial archeological patrimony in Italy. On the one hand, this is the base for a correct preservation policy and, on the other hand, for a scientific knowledge

Figure 2. Cotton mill at Vaprio d'Adda, near Bergamo, second half of the nineteenth century.

Figure 3. Abandoned cement works, later a warehouse; now a residence, at Alzano, near Bergamo.

of the phenomena connected with industrialism. In fact, a profound study of all the categories of objects-documents-monuments and a clear interpretation of the signs which they form mean the global reconstruction of a historical period. We, therefore, think that it will be possible to follow scientifically the itinerary of our own recent history from new points-of-view.

2. To introduce the instruction of IA in schools, cultural centers and associations, and in the universities. A few years ago continuing education courses were organized which centered on the understanding of the impact of certain elements of the industrial patrimony or, better yet, of the totality of the industrial environment, on the social conscience and on traditions. The I.S.I.A. has organized for 1978 several educational programs in collaboration with high schools and cultural associations.

3. To go beyond the passive phase of preservation to a policy of conservation of the historical industrial patrimony. The conservation of industrial monuments must be planned in order to preserve their productive function or to allow for a transformation of use. Therefore, the destiny of these monuments can be decided through plans produced with the participation of the citizens.

One can easily see that the future protagonists of IA in Italy will be those who have created it: the scholars in search of more scientific bases for their work, the institutions which operate in the field of Cultural Resources, and the large parts of the population which more and more identify their own history and their own social and political condition with the "monsters of mechanization."

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8 INDUSTRIAL ARCHEOLOGY IN ITALY: EXAMPLES OF INDUSTRIAL ARCHEOLOGY IN THE URBAN AREA OF MILAN

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Industrial archeology is beginning in Italy at a moment not only of economic crisis, but also of self identification and experimentation. I am referring, especially, to the traditional gap between liberal and technical arts which has always, somehow, dominated the political and cultural programs of historical preservation in our country. There is much to be said about this as an issue, especially in a country which is so rich in historical artifacts that sometimes they become a very heavy inheritance to protect and safeguard. As a matter of fact, there isn't in Italy sufficient economic power and political willingness to be able to draw a program of preservation for all our monuments. In this context, of course, industrial artifacts are not likely to find favorable reactions among the people in charge of national legislation.

The attention toward monuments has always effected artifacts linked with cultural and historical "peculiarities," which has determined some neglect for artifacts testifying of a sort of "minor" civilization. The Italian delay in the process of industrialization had caused an even greater lack of public recognition for industrial monuments; they are not very "antique," but rather, appear as "obsolete;" they don't belong to the glorious periods of Italian history, they testify of poor conditions of life, often connected with misery, pollution, and human exploitation. The unattractive surroundings in which they stand, especially in big cities, are often seen as something to be ashamed of, to hide away, or to cancel definitely from the urban scene. The continuous process of self destruction of abandoned industrial buildings, the disappearing of their archives and written documents, the ceasing to be of the last actors of the industrial revolution mean an irreversible loss of human dignity and of self awareness. Apart from the pure pleasure of collecting old fashioned things, apart from the feeling of nostalgia for old times, we believe that industrial artifacts, as well as churches, towers, and palaces of which our country is so rich, have the right to be preserved and to be considered as monuments.

It is true that literature has often dealt with the phenomenon of the industrial revolution, but it is also true that there is still a great deal to be said about the physical environment which has meant for millions of individuals a set way of behaviour, of organization, and of relationships--in a few words, their own life.

In this respect, the aim of the Italian Association for Industrial Archeology is mainly a political one which stands for a very precise point of view and has, so far, created a great deal of interest in two of the main universities of Milano.

In 1976, at the Faculty of Architecture, scholars have begun research into the industrial archeological remains of the 19th and 20th centuries in the urban area of Milano. This kind of research assumes a very important meaning if one points out that cities have always been the place where structural changes have ocurred. Therefore, here more than anywhere else, we can find the dynamics of capitalism and industrial society. The modern city, born with the industrial revolution and grown according to its needs, represents, indeed, a synthetic section of the present social strata, of their methods of selecting and of their way of surviving.

In the first phase of our research we have studied the growth of Milan as an industrial center; there are, of course, certain factors that need to be stressed more than others, such as the role of the city as a productive and consumer center for the large and rich countryside which surrounds it, its geographical position which makes it a forced point of intersection for all the main routes of central Europe, its long established tradition of reasonable economic legislation, and the concentration of huge amounts of capital in the various banks operating since the 17th century. Because this research was intended for a school of architecture it seems extremely

appropriate to study first the complex way in which the industrial revolution has changed urban environments. Thus a sectorial history such as "industrial history" has become part of the material-cultural development of the whole city. This can be regarded as the first step toward industrial archeology in itself and has provided students with better means of comprehension for future research.

Next was analysis of the industrial entity of Milano at the turn of the 19th century, assuming as a main goal the recording of all productive activities in the urban area. Because of this archive it now will be possible to draw a map showing the industrial archeological remains of the city in comparison to its original patrimony. In the meantime, the artifacts already known to survive are being recorded. Afterwards we plan to concentrate on the area with the most significant objects and to work on them in order to reinsert historical monuments into the social dynamics of modern needs.

In one railway district in the south of Milano, for example, there are still quite a few industrial archeological artifacts. One of them is an abandoned pottery mill which has been taken over by a group of young people for new theatrical experiences. Though this effort could be considered rough and naive, it meets a spontaneous need for a center of cultural and social activities in a district where there is none. As a matter of fact, industrial buildings have proved themselves useful for a lot of purposes. In Torino, for example, where local authorities seem to be more senstitive to industrial archeology, a group of architects is studying the best way to adapt abandoned factories to Junior High Schools, for which use such buildings seem very appropriate.

After one year of investigation it is possible to say that the industrial archeological remains of Milano are not due to a specific political willingness to preserve them as monuments. If they survive this occurs because of casual events, as in the case of old iron machinery which still bear an economic value and can still be bought in junkyards at fairly good prices per kilo. Sometimes the remains of the industrial revolution have survived because they have become familiar shapes in the aesthetics of modern art, or because they are considered a political symbol. This is the case of the monument to Roberto Franceschi who died in the students riots of 1972; this huge hammer of the 19th century is in fact dedicated to all the people who have suffered and died to restore the workers' human dignity.

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9 MUSEUM INTERPRETATION OF I A MATERIALS: A CONSIDERATION OF THE REVIEW PROCESS FOR GRANT APPLICATIONS

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Jefferson County Historical Society
Watertown, NY

The Jefferson County Historical Society in Watertown, NY, is the repository for the nation's definitive collection of hydraulic turbines. But it is not the repository for the nation's authority on hydraulic turbines. Therefore, much learning has been necessary and has, indeed, taken place with the aid of some of the most knowledgeable people in the field as made possible by an NEH planning grant.

The Society now wishes to exhibit this outstanding industrial collection, but has been unsuccessful, thus far, in meeting the humanities content required in its proposal to NEH--the criteria are outlined below.

National Endowment for the Humanities
Museum Program
Criteria for Review of Applications

Applicants are asked to address themselves to the following questions in preparing and reviewing proposals:

1. Does this program--installation, orientation, presentation--employ methods of interpretation that bring the adult general public into direct contact with collections or is the presentation an attempt at substituting technology for objects?

2. Does this proposal bring together museum staff specialists to plan and execute the interpretive program and/or exhibition, i.e., curator, educator, designer? In terms of scholarship, is the exhibition content sound so that the interpretation can be fully and competently developed?

3. Is technology employed to provide a cultural and historical context? If so, does this technology appear as an aid to understanding or as a gimmick for grant justification? Does the application state that provisions will be made for proper maintenance of audio-visual and other technical equipment in connection with the exhibition?

4. Do labels, maps, printed materials, photographic illustrations as well as programs associated with the exhibit which are intended as educational aids seek primarily to translate and juxtapose objects to a contemporary society where possible?

5. Does the overall concept of the exhibition have potential appeal to a diverse public? Will new audiences be developed because of the exhibition?

6. Does the proposal relate to the humanities?

7. If the exhibition is to travel, either in whole or in part, will it appeal to other kinds of audiences not designed to reach in the opening (first installation) of the exhibition?

8. Is the cost realistic? Does the cost-sharing seem adequate? Is the cost of the interpretive component justifiable?

Specific to Community Education Applications:

Is the audience to be reached involved as an integral part of the planning and execution of the proposed program?

While two proposals have been submitted for an exhibition using the Kinne Hydraulic Turbine Collection--the second being made following a $2,500 planning grant--no exhibition grant has resulted. To date, two completely different approaches have been used and a third has been suggested through panelists' evaluations, namely: that a future proposal focus largely upon the early development of the American hydraulic turbine as it affected the lives of people in the North Country.

Insistence upon too specific limitations will, however, hamper the interpretation and presentation of the historical and technological aspects, which are as germane to an understanding of the value of waterpower during the developmental period for American hydraulic turbines in the mid-19th century, as is the interesting but somewhat elusive exposition of the impact of hydraulic turbine development upon the life and lifestyles of that period. What guidance can industrial archeology provide? Where do we go from here?

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10 AN ARCHEOLOGICAL AND SOCIAL EVALUATION OF WHAT MAY BE AMERICA'S FIRST INDUSTRIAL SUBURB

Thomas and Jeanne Scatchard
Philadelphia, PA

Northern Liberties was established to the north of the old city of Philadelphia, which was originally laid out with Vine Street on the north to South Street on the south and between the Delaware and Schuykill rivers. The particular sector investigated here is the section north of Spring Garden Street and from Ninth Street east to the Delaware River.

Because the first intention of Penn appears to have been the sale of building lots, plots in the old city were laid out with narrow fronts facing the street and comparatively deep--a typical plot being 15-25 foot front and 75 to 125 deep.

After the layout of the city and the subdivision of the relatively small building lots, it appears that the land north of Vine Street was referred to by Penn at the time of his arrival in 1682 as "Northern Liberties." This land was allotted to those who purchased building lots in the city in tracts of an average size of approximately 80 acres, and the boundaries of each person's tract rather vaguely defined. Penn had insisted that the street lines in the old city be at right angles and "not askew." Northern Liberties' residents deliberately created street patterns at all angles. The different plot size and shape gave wider freedom to industry. The pattern followed the late 18th century style of having a home and work shop either in the same building or very close together.

The early development of the area began with the growth of shipyards along the Delaware River. The banks at this point were firm and the approximately five to seven foot tide made for easy shipway construction. The land behind the banks was solid ground allowing construction of the necessary supporting services--foundries, rope and cordage works, sailmaking and wood working shops. In addition to those industries tied to shipbuilding, there were a wide variety of plants and workshops, some going back to pre-Revolutionary times. National Lead made red and white lead in 1772 (this is their present name). Philadelphia Quartz still has a plant on the original site.

Although the Delaware Expressway and "redevelopment" have destroyed much, there still exists an industrial section north of Spring Garden Street and east of Sixth Street which not only has many diversified industrial locations, more important, contains within its limits a viable population constantly maintaining and improving housing by their own efforts.

Northern Liberties was originally a separate entity from the City of Philadelphia, only becoming part of the City in 1854. It had its own governing body, known as The Commissioners, and its own police and fire companies. The fact that industry and housing from the beginning, were spatially integrated had a definite bearing on the life of the people. Neighbors were neighbors both at home and at work. The earliest arrivals to settle in Northern Liberties were the German Lutherans and a German Society was formed in 1764. Later, German Catholics arrived and at the time of the Irish famine many Irish Catholics also settled there. The homes, many of which still exist, were row houses and limited in style by the building materials at hand, as were the business buildings.

The people in this section of the city, many of whom represent the fourth or fifth generation to live in the same home, survive in a tight little island surrounded by the rest of the city. They will go almost to any lengths to preserve their cultural and ethnic integrity. The people for the most part are working class; mechanics of a grade superior to laborers. Boyd's Directory shows a larger proportion of carpenters, millwrights, and plumbers than this one section of the city would require. These people continued to live here but work elsewhere throughout the city.

It is interesting to note that this area, which is such a mixture of industry, homes, and businesses has remained in spite of all the upheavals of the second half of the 20th century, more stable and more homogenous than many more "properly zoned" areas of the city. One is inclined to agree in some ways with the lady sitting in front of her store who recently proclaimed to the authors that this was the best part of the city, and she meant to keep it that way. At least, if it isn't the "best part of the city" necessarily, it's a good, sturdy, hardworking independent one. The question now is what can laymen with some knowledge of the methods of industrial archeology do to lend support to the survival of such an industrial community.

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