



SOCIAL APPROACHES TO AN INDUSTRIAL PAST

**The Archaeology
and Anthropology
of Mining**

**Edited by A. Bernard Knapp, Vincent C. Pigott
and Eugenia W. Herbert**

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To the memory of my coal-mining ancestors, especially my grandfather Harry Everett Davis.

A.Bernard Knapp

To those nineteenth-century miners who left their ineradicable mark on the Rocky Mountains of Colorado and provided me from boyhood with a source of endless fascination.

Vincent C.Pigott

To Alexander, Jesse, Bethany and Matthew.

Eugenia W.Herbert

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Foreword

‘Mining is a community of occupation, not a community of place, like farming.’ Municipal Judge Neil V. Reynolds, a fifth-generation resident of Leadville, Colorado, was credited with that quotation in a recent newspaper article (*International Herald Tribune*, 7 November 1997, p. 24) describing the efforts of his home town to raise money from the Guggenheim Foundations in order to support Leadville’s National Mining Hall of Fame and Museum. The residents of Leadville turned to this source because the Guggenheim fortune, the basis for the four Guggenheim Foundations now located in New York City, began in Leadville. In the late nineteenth century, the Guggenheim family extracted an estimated \$268 million worth of lead and silver from the mines in the vicinity of Leadville, but all this wealth was taken out of the region. Today the population is one-tenth what it was in the 1880s. As Judge Reynolds put it, ‘Nobody who made their money here did anything for this place.’ Today Leadville stands a bleak monument to the ‘get rich and get out’ mining ethic (as noted by James Brooke, author of the *IHT* article cited above).

Having had the pleasure of participating in the Bellagio Conference on The Archaeology and Anthropology of Mining, a rewarding experience in every respect—intellectual, social and gustatorial—I believe that Judge Reynolds’s observation goes to the very heart of all the problems involved in any attempt to study the archaeology and anthropology of mining communities. Mining is indeed ‘a community of occupation, not a community of place.’ For this reason mining communities—the villages and encampments of the miners, their families and their female associates—are most likely to be rather ephemeral affairs, created by individuals who always saw their residence at the site as temporary and transitory, and therefore destined to leave little trace in the material record.

The mines themselves, of course, do not move, and mining archaeology—to the extent that it has been devoted to the reconstruction of what went on in the mines themselves—has enjoyed phenomenal success in recent decades. The Roman mines of Spain, the medieval mines of France and the Neolithic and Bronze Age flint and copper mines of southeastern Europe and the British Isles have been studied and published in a series of highly successful research

programs. The great impetus for the study of prehistoric mining archaeology has come from the introduction of radiometric dating techniques, making possible for the first time the accurate dating of archaeological contexts that in the past could only be described as 'pre-Roman' or 'pre-Celtic.'

The archaeology of mining communities, on the other hand, provides quite a different story. The papers delivered at the Bellagio Conference, devoted to elucidating some 'social approaches to an industrial past,' all too clearly demonstrated the difficulties involved in trying to reconstruct the lives of the miners themselves, who they were, where they came from and how they interacted with the world around them.

With the help of a written record, as is available for early modern mining towns (like Leadville, Colorado), answers to these questions can often be suggested. In a prehistoric context, however, answers have seldom even been proposed, in however tentative a fashion. What was attempted at Bellagio in July 1996 was to bring together scholars who work in ancient and modern, prehistoric and historic archaeological contexts, and to add the dynamic input of social historians and anthropologists, in order to compare and contrast, to look for difference and commonality, and to study mining communities as a social phenomenon, not one bound exclusively to the minutiae of the archaeological record.

For a scholar like myself, attempting to make sense of excavations conducted in 1938–1939 at what remains the only investigated Late Bronze Age mining community (now utterly destroyed) on the copper-rich island of Cyprus in the Eastern Mediterranean, the Bellagio Conference was a sobering experience. It was obvious that, as a Cypriot archaeologist, I had much to learn. Any understanding of that Late Bronze Age site (Apliki *Karamallos*) in the mineralized zone of Cyprus's Troodos Mountains will be forthcoming only if we ask the right questions. The chapters of this book formulate many of the right questions, and even suggest some possible answers.

James D. Muhly, Director
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Social approaches to the archaeology and anthropology of mining

A. Bernard Knapp

ABSTRACT

The study of the mining of metals—the bailiwick of several different disciplines— reveals great diversity of approach. In the most general terms, social historians, archaeologists and archaeometallurgists tend to focus on the history and technology of mining, on metallurgical technology and on the mining process overall. Historians of mining and ethnographers tend to examine the socio-economic, spatial and ideological dimensions of past industrial cultures. In the attempt to reorient these divergent approaches in a more dynamic direction, contributors to this volume focus on the social context of the mining or metallurgical community as revealed in the material, ethnographic and ethnohistoric records of various cultures worldwide, from prehistory to the recent past. The mining community provides the focal point for information about human activity on an industrial frontier. Although mining communities are often socially and spatially remote, they are linked into broader social, communications, transport and economic networks by virtue of their ability to supply a raw material in demand to a regional or world system. This volume brings together the research of archaeologists, ethnohistorians and anthropologists to consider themes of common interest, and to explore relevant interdisciplinary issues. These studies are oriented around specific, interweaving themes: the social context of production; gender; power strategies and labour exploitation; imperialism and colonialism; and production and technology. Such themes, and the material or ethnohistoric features and human behaviour that permit us to discuss them, are well known to social historians and ethnographers; archaeology, however, has only begun to develop the kind of social theory essential for treating the material components of an industrial past.

INTRODUCTION

The mining and manufacture of metals have formed a major aspect of production and social reproduction over the past six thousand years, and have employed millions of people throughout the Old and New Worlds. All industrial societies were erected on foundations of metal, and still require vast

quantities of metals for their existence. Substantial areas of the earth's surface have been transformed by mines or by the pollution that forms a common adjunct to mining and metallurgy. Mining may be regarded as an extension of people's search for natural materials used in the production of tools, weapons and ornaments (Weisgerber and Pernicka 1995:159). The exploitation of resources, the selection of tools, the organization of labour and the sequence of acts that make up a technological process are in fact key components of social behaviour and human choice (Childs and Killick 1993:325). Once metal is obtained from ores, it is invested with multiple and changing social, economic and politico-ideological roles. Metals and metal artefacts often take on material and symbolic expressions of wealth/status, ethnicity, fertility and other 'life changes', as well as religious or ideological affiliation (Childs and Killick 1993: 330–332). In the preindustrial world, moreover, metals were valuable commodities, and Bronson (1992:65) argues that their value was enhanced when transported by sea.

Despite the vast amount of financial and human capital devoted to mining and related activities, their scholarly study has until very recently focused on technological factors or on economic and labour histories. Only within the past decade have archaeology and cultural anthropology embarked upon more innovative studies of the social, spatial and ideological dimensions of technology and of past or present industrial communities (e.g. Childs and Killick 1993; Godoy 1985; Pfaffenberger 1992). Technology is not simply a scientific force but also a social process that involves human behaviour and negotiation, a complex ideology, and the extraction and manipulation of resources—human and material. Mining and metallurgy in preindustrial settings were often imbued with rich symbolic content, the study of which illuminates various aspects of culture that have little to do with metallurgy *per se*. Mining communities, like the emporia that distribute their products, cannot be understood in a cultural vacuum (Weigand 1982:3).

Even though many cultural features associated with technology, mining and metallurgy are known from ethnohistoric documents or ethnographic fieldwork, archaeology has had to develop its own devices to assess the material components of an industrial past. The use of ethnohistoric and archaeological evidence as contrasting data sets, and the attempt to integrate archaeological, anthropological and historical approaches, fit squarely within current trends to develop a socially oriented, human-science approach to the study of the past. Recognizing this interdisciplinary dynamic, we (Bernard Knapp, Vincent Pigott, David Killick) organized an international conference which was held at the Rockefeller Foundation's Bellagio Study and Conference Center on Lake Como, Italy (22–26 July 1996). The substantially revised papers from that conference which are published in this volume span the past 4,500 years and cover the areas of the Americas (including the Arctic), Australia and New Zealand, Egypt, sub-Saharan Africa, Europe, the Mediterranean and Southeast Asia.

This volume brings together prehistoric and historical archaeologists, social historians, archaeometallurgists and anthropologists, all of whom are widely recognized as innovative thinkers in their respective fields, to consider themes of common interest, and to explore certain social approaches to an industrial past. If the immediate goal of the conference was to acquaint scholars from different fields with the current status of research in other fields, our aim in this volume is to explore how these closely related but still diverse approaches may better be integrated; we believe this marks an important advance toward an interpretive, interdisciplinary approach to the archaeology and anthropology of mining.

In his recent comprehensive study of early mining, Craddock (1995:1–2) confines his discussion to information that can be derived directly from material evidence. He believes that ‘the composition of materials can give far more unambiguous information on the technology of the process that produced them than on the society that made and used them’ (Craddock 1995:2). This belief in the superiority of ‘immutable chemical properties’ to ‘less perfectly formulated theories of workings of human society’ takes little account of current debates among scientists themselves about the value or worth of the ‘scientific’ record, the scientific community and the entire scientific endeavour (e.g. Ruse 1996; Shapin 1996). It is also a self-fulfilling prophecy, since the more that specialists who study mining and technology avoid theoretical and social approaches in favour of the empirical, the more difficult it will be to gain *any* new insights into the social aspects of those fields. Craddock’s opinion must be considered, and his work on early metal mining and production is essential to this field. But it is only one opinion and only one, quite narrow approach.

In contrast, our main focus in this volume is to examine various social aspects of mining, especially mining *communities* (in addition to mining settlements or mining landscapes, ostensibly more accessible to archaeologists). To do so, several themes have been singled out for emphasis and exploration. In this introductory chapter I attempt first to consider the concept of the mining community as construed by fields ranging from sociology to the history of mining. I then present and expand upon the various themes as a means of introducing this volume, raising new questions, stimulating new ways of considering mining communities, and provoking contributors and readers alike to reconsider long-held notions in their respective fields. The intermingling of divergent scholarly interests should help to advance significantly the study of an industrial past and lead to a more dynamic, social synthesis.

THE MINING COMMUNITY

The work of ethnographers, social historians and sociologists alike demonstrates a fascination with the distinctive character of mining communities (e.g. Bulmer 1975; Tenfelde 1992a; Thompson 1932), especially capital-

intensive mining. Perhaps the most fascinating aspect is the collective behaviour resulting from the dynamic between working and living in settlements structured around a single commodity or, in the modern world, around a single industry or technology. The nature of minerals fixes the location of underground mines, which in turn influences the location and layout of a mining community. These same factors entail the movement of people, some degree of labour specialization, dependence on a single economic activity and—where there is capital investment—a large degree of reliance on the mining company (Bulmer 1975:61). In more recent mining communities, the fate and well-being of labourers are largely determined by economic forces external to the community; social change, moreover, is often instigated or mitigated as a result of large-scale economic factors beyond its control. Endogenous forces, both enabling and constraining, also impact the dynamics of a mining community; some degree of local autonomy and social solidarity, on the one hand, may be offset by rapid population turnover or by religious and ethnic boundaries, on the other (Bulmer 1975:69).

Capital-intensive mining such as this must be distinguished from preindustrial, ‘carnival’ or ‘informal’ mining activities. The case studies in this volume help to clarify the distinction between large-scale, state-run mining endeavours, and smaller-scale, kin-based mining activities in precapitalist settings. Growing evidence exists for autonomous mining communities in prehistoric or preindustrial societies, in particular those that depend, apparently, on seasonal and non-specialist labour.

The mining community—or camp, or village—represents the domestic space of people who often were or are heterogeneous in character, of diverse origins, and drawn together by the need to work (Roberts 1996:5, 10). Such communities are more often than not expedient and impermanent: when mines shut down or when ore bodies are exhausted, the mining community itself fragments or dies as miners scatter to new strikes and new opportunities. Geographic mobility, then, is common while social mobility is rare: the opportunity to rise to a higher occupational stratum was always extremely limited. Once a miner, always a miner...but what kind of miner?

In a brief report on the Bellagio Conference, Ehrenreich (1996) suggested that the full-time, wage-earning miner was a phenomenon of the Industrial Age, in particular of the past two centuries. MacMillan (1995), writing on the Amazonia gold rush of the 1980s, used the term ‘informal mining’ to describe a system in which people engage in mining only as a part-time activity. Most of the time these ‘miners’ are in fact farmers, ranch hands or wage labourers. Godoy (1985) also makes the general point that, in highland Bolivia, periodic and part-time mining has long served as an alternative occupation for marginal peasants. Most early mining, from prehistoric to medieval, was carried out by individuals who lived in agrarian-based communities, and was conducted chiefly during periods of the annual cycle when people were unable to farm. Such individuals came together as a community—real or imagined—at specific

times to mine or smelt metallic ores whose products had utilitarian, economic, prestige or ideological value. Some of these communities mined or smelted only the ores needed for their own agricultural or everyday needs.

During the eighteenth century in the American Southwest, mining camps 'flared and faded', but all served as temporary magnets of settlement for thousands of Native Americans, Spaniards and *castas* (people of mixed race), at least as long as the ore deposits continued to spawn metallic wealth (Sheridan 1992: 159). In an unpublished study of nineteenth-century mining in California and Nevada, Douglass (1979; this volume, Chapter 6) discussed the nature of social recruitment to the mining camps of that era. The typical California camp was more a collection of strangers than a community of friends or kinsmen. The camps exuded a sense of urgency and transience, and the typical 'miner' seldom remained in one. Indeed, by the end of the nineteenth century, there occurred an almost quasi-nomadic movement, primarily of men who were born and raised in mining or former mining towns in California and Nevada, and who followed the rich discoveries of gold and silver to the end of the rainbow. These 'rushes' from one field to another, in other words, resulted in a significant mobile population of miners in the American West, whom Douglass described as 'a community without a locus'. This phrase cuts to the heart of many a mining community, throughout time, and in some respects accounts for the strikingly thin level of evidence, even of material variability, for mining communities in the archaeological and ethnohistoric records. Such communities came together briefly as mining camps centred on new discoveries. Douglass maintains that those involved in these communities without a locus came to know each other well, and developed their own traditions and values which transcended the experiences of any single camp. As a result, a skilled, self-aware community of miners persisted well beyond the use span of any specific rush site.

These examples, and several of the case studies presented in this volume, suggest that the organization of a small mining community was quite fluid, often temporary and ephemeral, and certainly expedient as far as structures or other material remains are concerned. In fact, the material culture recovered through excavations at historical sites in the USA, Australia and New Zealand usually reveals limited evidence of ethnicity, class, gender or even wealth (see this volume, Chapters 3, 4 and 5, by Lawrence, Simmons and Hardesty, respectively). Beyond factors of impermanence and fluidity, the lack of variability in material culture would have resulted from the fact that many miners previously had little access to wealth and planned to work only a short time, strike it rich, and make their investments elsewhere. Moreover, the remoteness of mining camps, or the fact that the only store available was a company store, meant that there was little variety in material culture to choose from. Finally, the wealth amassed by the mining companies was only rarely invested or spent in the mining town or camp itself; more often it went to owners and stockholders in the major urban centres (Ehrenreich 1996:55).

How then may we envision the social structure and material character of a traditional mining community? Bulmer (1975:85–88) suggested that such communities may exhibit the following characteristics:

- 1 physical isolation, and a dispersed settlement system;
- 2 economic predominance of mining;
- 3 exacting, dangerous and periodic work;
- 4 occupational homogeneity and isolation;
- 5 communal leisure activities (religious, sporting, drinking) where work remains the chief interest and topic of conversation;
- 6 sharply segregated family and gender roles;
- 7 economic and political conflict between miners and managers;
- 8 multiple and complex communal social relationships: solidarity, shared histories of work and living, inward focus.

But how, if at all, do such factors, which typify more recent and capital-intensive mining communities or camps, relate to smaller-scale, temporary communities or smelting sites; that is, to archaeological realities and the study of an industrial past? How, if at all, may they help us to understand better the material or social record of mining communities?

We cannot assume that all prehistoric metal producers operated on a local and therefore small scale; metals, especially when transported, were valuable and very tradable commodities, often in high demand over vast regions (e.g. throughout the ancient Mediterranean world for almost three thousand years, *c.* 2500 BC to AD 500). Bronson (1992:104–105) argues that the image of the village smithy mining and smelting only enough for local needs is emotionally appealing but culturally improbable: most small-time producers of metal who are known historically or ethnographically are or were commercial smelters who sell at least a portion of their output—whether ingots or finished products—to non-locals. The majority of documented preindustrial miners or metalworkers did not labour alone but in communities where there were multiple furnaces and a significant level of cooperation in mining, producing fuel, and building and maintaining equipment as well as lodgings. Bronson (1992) believes that these factors may have been typical of prehistoric mining communities, which would have contained up to twenty-five families or households producing between 5 and 15 tons of metal each year.

Hardesty's work in the historical archaeology of mining communities on the American frontier during the nineteenth and early twentieth centuries indicates that the most common household situation was a small group of unrelated males living under one roof and sharing some domestic chores, but otherwise unintegrated by other organizing principles of society (Hardesty 1992:180–182). Hardesty (1992:186–191) suggests that the most common household types in the frontier mining communities of the Old West were organized around mutual aid or cooperation, around families, as occupational collectives

(e.g. miners, brothels, saloon-keepers or store-owners), and as work groups. The material evidence, however, differs from written accounts: instead of clearly defined households (based on census records in Hardesty's case), the archaeological record represents the end product of a time series, a kaleidoscopic view of domestic cycles—or of a 'household series' (Smith 1992:30)—that changed throughout the occupancy of various dwellings within a village. The main material indicators of household variability in American mining communities were architecture, artefact assemblages and site layout, including the use of house floor area to estimate the size of the residential group. There is some general archaeological evidence to suggest that the most typical house size in a mining community was about 350 square feet (33 square metres), in which groups of two to five people would have lived. A study focused on the faunal and pottery samples from the historic townsite of Grantsville, Nevada, revealed that pottery was a more reliable indicator of variability and ethnic or socioeconomic status than were bones of animals consumed at the site (Schmitt and Zeier 1993).

Images and perceptions of recent or modern mining communities obviously cannot be retrodicted directly into the prehistoric, classical or medieval past. Shennan (1993:66–68) nonetheless has noted that the individual mining communities of the central European Bronze Age had limited numbers of inhabitants and therefore did not sustain any significant degree of internal differentiation. Moreover, he has argued (Shennan 1991) that Bronze Age copper mining was mainly a winter activity, an observation that tallies well with the more recent and contemporary evidence for 'informal' mining. Similarly, mining expeditions during Egypt's Middle Kingdom (c. 2040–1650 BC) seem to have been dispatched when the Nile River had flooded and farming was impossible (Shaw, this volume, Chapter 15). A hilltop mining village consisting of 125 stone-built structures and dated to the Egyptian Old Kingdom (c. 2650–2180 BC) showed no evidence of seasonal activity but reflected very well the isolation and even vulnerability of a tightly clustered mining settlement expediently situated in close proximity to the turquoise and copper mines of the Sinai Peninsula (Shaw 1994: 114–115). In addition to seasonality, isolation, economic orientation and household make-up, several other facets of a traditional mining community can be seen in the material record. The themes highlighted here (see next section) represent an attempt to tease some of those facets out of the archaeological studies presented in this volume.

The relative isolation of the traditional mining community is increasingly rare in the postmodern, consumerist, communication-oriented society of the late twentieth century (Tenfelde 1992b:1211–1212). After World War II, when the study of social history enjoyed a new prominence in the wake of the *Annales*' impact on the field, the attention focused on mining communities sharpened. More interesting is the fact that the phenomenon of analysing the miner's community occurred at the same time that these very communities, particularly those which belonged to the older, industrial nation-states (i.e. the UK,

Germany, France, Belgium) were fading out of existence. The changing energy demands of the decades between 1945 and 1965 led to the exhaustion of many formerly productive mineral deposits, and to increasing costs for producing a resource such as coal in comparison with newer and cheaper sources of energy. The mining of iron ore, moreover, had been reduced to a level of activity more suited to a relatively small branch of the industrial world. However, it is likely that the more basic reasons for the intensified study of mining communities are to be found in the changes that occurred in mining technology and in the lifeways of the miners themselves (see, for example, Godoy 1991; Holloway 1996; Nash 1993). The modernization of mining technology and the political strategies and successes of capitalism over socialism fundamentally reversed the image as well as the reality of the mining way of life.

In sum, the new awareness and concern with traditional mining communities arose at approximately the same time that this unique, uncommon way of working, earning and living was coming to an end. Most of the studies presented here seek to expand upon our knowledge of the traditional mining community and its social technology, even as this page of the industrial past is about to be turned for ever.

Themes and issues

The history of mining and metallurgical technology is a topic well represented in both academic and popular literature (Craddock 1995; Domergue 1989; Lavender 1962; Shepherd 1993). Archaeologists have considered the technology of mining, and the productive process overall (e.g. Dutton *et al.* 1994; Ehrenreich 1991; Hardesty 1988; Lechtman 1996; Weisgerber 1982, 1989; Weisgerber and Pernicka 1995), but have yet to integrate fully into their work the social, politico-economic, spatial and ideological dimensions of past industrial cultures (see Childs and Killick 1993). Anthropologists have considered economic, ideological and organizational aspects of mining (e.g. Godoy 1985, 1991; Nash 1993), but often from opaque Freudian or structuralist perspectives (e.g. Eliade 1978; Taussig 1980). Social historians of mining and some historical archaeologists, however, have written extensively about gender, class, age, spatial segregation and other issues directly relevant to the themes of this volume (e.g. Frazier with Brown 1992; Herbert 1993; Hosler 1995; Lankton 1992; Schmitt and Zeier 1993; Simmons 1989).

In addition to the book's focus on the social context of the mining or metallurgical community as a means of engaging the wide range of interests and expertise represented in this volume, a series of general, overlapping themes helped to orient our diverse approaches: gender; power strategies and labour exploitation; imperialism and colonialism on the mining frontier; production and social reproduction; and production and technology. Various chapters emphasize other themes that were developed in order to utilize the full, interdisciplinary range of evidence:

- 1 examining social structure and social interaction in mining towns and camps;
- 2 understanding earlier technical practices and technological knowledge; and
- 3 reconstructing the social organization of metal production from material remains.

Such topics have relevance to any people whose culture and history are bound up with the mining and exploitation of natural resources; they also highlight the significance of archaeological or ethnographic fieldwork to cultural heritages, to ethnographic histories, and to understanding and negotiating difference across changing societies.

The literature—or, more accurately, literatures—on past mining and metallurgy have yet to achieve a synthesis of the technological, economic and social aspects of these activities. Archaeologists and archaeometallurgists impressively reconstruct the *chaînes opératoires* of past miners and metalworkers from surviving material evidence, and on that basis assess the growth of technical knowledge. As yet, however, there exist few attempts to investigate the social reality of ancient or prehistoric miners, mining towns and camps. Cultural anthropologists and social historians, for their part, have produced rich accounts of the social life of miners, but still seem largely unaware of the wealth of evidence and insights to be gained from material culture.

Material remains, whether from the field or in the laboratory, are the stock in trade of archaeologists and archaeometallurgists, who are often able to reconstruct mining processes and metallurgical facilities with an extraordinary degree of detail. The composition and microstructures of various metal artefacts may offer good evidence for long-distance trade and/or technology transfer. Discussion of these topics may be found in the chapters by Robert Ehrenreich (Canadian Arctic— Chapter 7), Vasiliki Kassianidou (Iron Age Cyprus— Chapter 14) and Vincent Pigott (Bronze Age Thailand— Chapter 13). Historians of mining rarely make adequate use of the available material evidence to reconstruct either the working or the home environments of past miners and metallurgists. However, a number of fields—anthropology, industrial archaeology, art history, folklore, rural history—reveal a growing concern with the use of material culture as historical documents. Of widespread current interest in the social sciences, this issue is treated in chapters by Terry Childs (Africa – Chapter 8), Susan Lawrence (Australia— Chapter 3) and Alexy Simmons (west/northwest USA, New Zealand— Chapter 4).

Conversely, social and labour historians and cultural anthropologists have made issues of power and resistance, poverty, and risk central to their research on mining. Miners, both today and in the recent past, are prone to sudden death and traumatic injury, are generally poorly paid and housed, and are often ruthlessly exploited by powerful employers. In many precapitalist mining camps, they were slaves or convicts. These conditions led to frequent strikes or revolts, which constitute a recurrent theme in the literature on mining. Clearly the enormous benefits that metals have bestowed upon humankind in historic

times have to be balanced against the toil and misery by which they were won. Near the base of the Cerro Rico mountain in Bolivia, the city of Potosí became rich on silver and copper mining, grew to be larger than Madrid, Rome and Paris, and was one of the most famous centres in colonial Latin America (Holloway 1996). The local Indians in this region have been exploited for centuries in mines that have always been unsafe; those who escape death by accidents succumb to disease, with the vast majority contracting tuberculosis by middle age (Nash 1993). Issues related to poverty, risk and injury are treated in chapters by Robert Ehrenreich (Canada/Arctic– Chapter 7), Peter Bell (Australia– Chapter 2), Donald Hardesty (western USA– Chapter 5), John Rule (Cornwall, England– Chapter 10) and Thomas Sheridan (southwest USA – Chapter 11).

The social structure of mining towns and camps cannot be reduced to simple class divisions. In the colonial mining settlements of Australia and the Americas, linguistic and ethnic divisions within the working class also structured the communities, and it was not uncommon for miners from one particular ethnic group to constitute a 'labour aristocracy'. And in all but the most rudimentary and most isolated mining camps, gender divisions were present, along with a wide variety of domestic arrangements. Studies dealing specifically with gender and/or ethnicity are presented in this volume by Peter Bell (Australia – Chapter 2), Terry Childs (Africa– Chapter 8), Eugenia Herbert (precolonial Africa– Chapter 9), Susan Lawrence (Australia– Chapter 3), Stephen Shennan (Europe, Bronze Age– Chapter 12), Thomas Sheridan (southwest USA– Chapter 11), and Alexy Simmons (west/northwest USA, New Zealand – Chapter 4).

As Craddock (1995) maintains, archaeologists have limited access to knowledge concerning the social life of prehistoric miners and metallurgists; their attention is thus usually focused upon mines, slags and furnaces rather than on living areas. If nothing else, ethnohistoric studies can expose archaeologists to the vivid social history of mining communities, and stimulate them to balance impressive reconstructions of past technology with investigations of the social circumstances of the miners themselves. Studies by historical archaeologists who have worked in nineteenth- and twentieth-century mining and metallurgical communities in North America and Australia (Susan Lawrence, Robert Ehrenreich, Donald Hardesty, Alexy Simmons) help to provide a conceptual bridge between prehistorians, on the one hand, and social historians and ethnographers, on the other. Working with a mixture of documentary and archaeological evidence, several of the chapters in this volume explicitly tackle questions related to class, power and ethnicity, and whether these factors may be recognized in the spatial patterns and distribution of material culture in excavated mining: Carol Meyer (Byzantine Egypt– Chapter 16) and Ian Shaw (Bronze Age Egypt– Chapter 15) consider these themes in precapitalist contexts, while Vasiliki Kassianidou (Iron Age Cyprus– Chapter 14), Vincent Pigott (Bronze Age Thailand– Chapter 13) and Stephen

Shennan (Bronze Age Europe – Chapter 12) report on excavations of mining settlements in strictly prehistoric contexts.

Studies of mining and metallurgy have the capacity to expand and alter our understanding of processes of colonialism and imperialism, and the challenge of frontiers. Deposits of metal ores are unevenly distributed over the surface of the earth, and empires have often established mining colonies at a great distance to extract metals for home consumption. Very rarely are mining expeditions sent to an area devoid of an indigenous population; the earliest camps set up in a given region therefore often function as a type of colonial outpost (Ehrenreich 1996:55). Several chapters specifically examine issues related to mining colonies, or colonies established to trade in metals by precapitalist empires: Peter Bell (Australia– Chapter 2), Eugenia Herbert (Africa– Chapter 9), Carol Meyer (Egypt– Chapter 16) and Ian Shaw (Egypt– Chapter 15). These studies offer instructive comparisons of mining in both ancient and modern polities, a comparison that should be of interest to anyone who deals with issues related to colonialism, postcolonialism and imperialism.

How have such themes been considered within the disciplinary contexts of ethnography, ethnohistory and archaeology? How may they be linked to a more unified, social approach to an industrial past?

ETHNOHISTORY AND ETHNOGRAPHY

In ethnohistorically attested and modern mining communities, certain ecological, demographic and politico-economic patterns tend to recur. Mining populations, for example, often have higher fertility than do agricultural populations, not least because of higher infant and adult mortality or debility, but also as a result of early marriage for women, low child-rearing costs, a minimum number of females in the labour force (at least, outside the home or brothel), and the existence of menstrual or sexual taboos (Godoy 1985:206; Herbert 1993:72–73). Historical archaeologists working in the American Northwest have demonstrated from material and documentary evidence alike that the frontier prostitute comprised a significant and ever-present component of this labour pool (Simmons 1989; this volume, Chapter 4).

Mining is almost always a labour-intensive activity, and the successful mining operation necessitates a reliable, inexhaustible pool of labour. Most historically attested miners came from highly diverse ethnic and sociocultural backgrounds, but mining households were often co-residential, with the majority of men living under one roof. Some lived in bunkhouses or boarding groups, others with families, or in small, single-sex clusters (Hardesty 1988:15–16; this volume, Chapter 5). In the American West, mining communities were made up mainly of adult males from urban centres; they had high mobility and an incoherent sense of community—that is, they were highly individualistic. Most mining camps were also rife with class distinctions. The ‘hillside stratification’ in the

mining town of Virginia City, Nevada, is a good example: elite households typified the upper streets, and were followed in order—descending the hill—by commercial and government residences, working-class homes, the red light district and Chinatown (Reps 1975:276–277).

Precolonial African metallurgical communities, from large-scale undertakings exploiting a servile workforce to smaller-scale efforts by single family groups, were essentially temporary camps rather than permanent mining settlements. Such communities did not necessarily involve either specialist production or distinct social groups, but the organization of production was certainly non-egalitarian: the labour of women and younger men, even children, was controlled by senior males on the basis of their technical and ritual knowledge (Childs and Killick 1993:329–330; Herbert 1993:25–31). The politico-economic organization of most permanent mining communities is conditioned in part by locational factors such as isolation and inaccessibility, which, at least in historically recent periods, have given rise to self-contained communities such as unstructured, open-system camps (Bolivia, Colorado), paternalistic company states (Arizona, Chile, Peru), or the hermetic, totalitarian institutions of South Africa (Godoy 1985:205). Companies or their agents often sought to integrate the surrounding regions into a coherent economic sphere, in order to obtain not only capital and labour, but also food and other supplies for the physical operation of the mining camp.

Although the production process needs to be examined in its entirety, many studies that focus on the ideology and ritual of mining seem somewhat idiosyncratic. Eliade's (1978) Freudian analysis, for example, draws an analogy between obstetrics and mining that some might find questionable or even objectionable. On the other hand, while Eugenia Herbert's (1993) work reveals clearly such an analogy between obstetrics and metallurgy, she has stressed the *social* construction of gender and reproduction rather than the *biological* analogy of Eliade. Taussig's (1980) Marxist-inspired study of ideology and consciousness among Bolivian tin-miners, despite its literary qualities, tells us simply that belief systems—with their interrelated symbols and meanings—help to mediate between tensions or to fetishize evil. The material witness of this phenomenon is quite striking: each group of Bolivian miners sets up next to their work site a sculpted figure, often life-size, of a spirit called El Tío ('uncle'). El Tío is reminiscent of the Christian devil, a sort of underground divinity thought to own and control the disbursement of riches within the mountain deposits it inhabits (Holloway 1996). In African metal production, the shape and decoration of furnaces may offer evidence of a conceptual association between smelting and ceremonial rites involving gestation, birth or marriage (Childs and Killick 1993:328). These furnaces could also provide material clues relevant to the study of prehistoric behaviour. Moreover, the spatial separation of village sites and smelting areas (to keep sorcerers and sexually active women at bay) might be evident in archaeological surveys.

The social organization of mining is partially conditioned by the physical and/or sociocultural isolation of mining communities, and partially by the harsh

working conditions and labour requirements of the extractive and productive phases of mining (Godoy 1985:205). Hardesty (1988:1) envisions the mining frontier as a series of 'patches' or 'islands' (where ore bodies were located) colonized by miners who, because they brought their own cultural traditions with them, found themselves implanted in a sociocultural 'wilderness'. This does not deny, of course, the emergence or development of cultural and material traditions specific to the mining communities themselves, as exemplified by the widespread use of the El Tío figures in the Bolivian mines. To cope in their various, often remote, situations, miners adopted either a strategy of opportunity (to maximize their resource gains) or a strategy of resiliency (to survive under sudden environmental or politico-economic change). The maximizing strategy would tend to reduce variability in material culture, for example as miners would adopt the most effective, standardized tools and technology. The resiliency strategy, however, would tend to increase variability, for example as miners experimented with ways to cope under stress, or ways of changing the organization of labour to cut mining costs (Hardesty 1988:112–114).

A conceptual framework to examine the variability and interrelations between mining communities and the surrounding rural and/or agricultural villages might involve consideration of transport factors, provision of subsistence and fuel, mechanisms for social exchange (marriage, seasonal labour, prostitution), ideological dimensions and ecological alterations. In the African case, mining was almost always a seasonal activity, and whole families of miners would move into bush camps to work at mining and smelting, following which they would return to their villages and traditional agricultural pursuits. This situation reveals an almost complete overlap between differing modes of production. In such a situation, where miners *are* agriculturalists, is there any overlap in the different residential occupations?

Such considerations offer another possible means to bridge the gap between ethnohistoric or ethnographic and archaeological approaches to the study of mining communities and industrial society. How else might the information and evidence established by ethnographers and historians impact our understanding of prehistoric mining and material culture? How different are the approaches based on production and technology typically used by archaeologists?

ARCHAEOLOGY

The material record of mining sites, rural/agricultural villages and production/distribution centres is well suited to a study of archaeological variability from a broad comparative and chronological perspective (Knapp 1997). Within such a study, it is necessary to relate archaeologically visible mining 'settlements' to the more abstract concept of mining 'communities' (Hardesty 1988:101). Such communities will most often be situated in close proximity to ore bodies;

secondary locational determinants include water, supporting resources (timber, agricultural land) and gravity components (access roads, transport system, towns). Since much primary production occurred in close proximity to the mines, a certain amount of variation through time may be expected. Such variation, including craft specialization, depends on factors such as access to ores, micro-environments for effective smelting, and the organization of the labour force with respect to various sequences of production, political expediency, social control and economic demand (e.g. Brumfiel and Earle 1987; Costin 199; Lechtman 1991:45; Stech 1985:103).

Within a mining settlement, the social interactions that occurred, and the social and ethnic stratification that developed, will be evident to varying degrees in artefact morphology and settlement patterns; in the size, age and sex composition of the human population; in the extent and quality of prestige items and imports; in other industrial, ceremonial or habitational features preserved in abandoned or even buried mining 'sites'; and in information recorded during surveys of mining districts. The social and economic organization of mining *communities*, of course, can only be inferred from these material remnants, their spatial arrangement and their contextual coherence, which in turn must be considered within a framework built upon the productive, technological and ideological dimensions of mining. Where documentary evidence is preserved, another arena of investigation may be opened.

Within historical mining communities, demographic variability was often related not only to ecology, technology, ethnicity and social class, but also to individualism (Paul 1963; Hine 1980). The variability that results from differences in ethnicity, place of origin, status, gender and class may be visible in the material record, and thus should form one of the primary areas of interest in an archaeology of mining. The individualism typical of miners might also produce high variability in the assemblages of mining households, in contrast to the cooperative behaviour, and more limited variability, that might be expected to typify the material assemblages of the classic peasant or agricultural community (Hardesty 1988:103–104). The exception, of course, is the analogy of the more transient African mining community, where individualism versus cooperation would be relevant only on a symbolic level, where anyone with exceptional power risks the onus of isolation (as a 'witch') (Herbert 1993:15).

Despite their social and spatial remoteness, and by virtue of their ability to supply a raw material in demand, mining communities—past or present—are inevitably linked into broader social, communications, transport and economic networks. Hardesty (1988:1–5) maintains that links between the mining frontier and the outside world involve three types of interaction sphere: the material (transport networks, including food and supplies), the social (labour pool, immigration, gender ratio of population) and the informational (symbolic, financial, ideological). These interactions may also be visible in the archaeological record in the form of settlement layout, trash dumps, luxury goods and 'mass-produced' commodities, imports, skeletal remains, cult

paraphernalia, etc. Such interaction spheres necessarily would have overlapped: the transport of primary smelted copper from mines to production, refining or distribution centres, for example, may have necessitated travel through regions controlled by different communities. Such movements would have involved the negotiation of social relations beyond those required for the supply and distribution of a resource in demand (Lechtman 1991:46).

Political ideologies, and the sanctions associated with them, helped to organize and develop economic strategies, and to establish and legitimize the human configurations that directed these strategies (Knapp 1988, 1996a). It is not uncommon for specific historical situations, such as political revolutions, technological innovations or geological events, to serve as 'traumatic events' (LeRoy Ladurie 1979) or 'kickers' (Deiner 1980) and *eventually* result in a new sociocultural trajectory. It is generally acknowledged that technological innovations in and of themselves do not lead directly to major social changes: rather, the social milieu into which such innovations are introduced forms the backdrop for change (e.g. Heskell and Lamberg-Karlovsky 1980:260–261; McNutt 1990:98). Because special interest groups like miners or managers often use material items to restructure relations of power (Gamble 1986:39), such transformations may be visible in the archaeological record, and thus should form another focus of the archaeology of mining.

FURTHER CHALLENGES

The archaeology and anthropology of mining may be discussed in the context of several other issues, or themes, at least four of which feature in the chapters of this volume.

Mining and agriculture

Mining interests and activity may complement or compromise agricultural interests and activities (an example of MacMillan's [1995] 'informal' mining). For example, in the African setting, there are overlapping modes of production, where mining is often a seasonal activity and agriculture the norm. In twentieth-century Cyprus, to take a counter-example, agriculture has often suffered because mining companies discouraged drilling for water or any other activity that might distract potential workers from filling those companies' insatiable need for cheap labour. As an economic activity, mining is very sensitive to changing commodity prices on world markets, and mining companies brook no interference from other modes of production. The traditional agricultural base of Cypriot villages diminished dramatically during the middle decades of the twentieth century, when mining activities reached their production peak.

To cite a much earlier example in the Mediterranean: during the later stages of the Roman Empire in the Western Mediterranean (Edmondson 1989:98),

state-run mining became divorced from the local economy inasmuch as the mines were administered independently and often from a distance, while labour and skilled personnel were often imported. On another level, however, mining was integrated into the local economy, because the miners and anyone associated with the mining community had to be fed and provisioned. Moreover, the small-scale mining practised in the later Roman Empire was closely associated with an agriculturally based economy. Landowning farmers, for example, were often the only people with the resources available to exploit mineral deposits or to lease contracts to operate mining shafts in imperially owned mining districts. Agricultural workers also provided the readiest source of labour, especially during slack seasons of the agricultural year. When the Roman state fell on hard economic times, it was logistically and financially more sensible not to tie up its own administrators or soldiers in mining activities. When mining finally became economically unfeasible, or when the wider politico-economic systems that created demand for copper broke down, mining villages were abandoned unless their inhabitants had other means of support, or unless the level of production was reorganized to suit the needs and resources of a rural, village society.

The mining landscape

Within the mining community, various factors dictate the appropriation of the local landscape: natural resources; agriculture; production and dwelling sites; communications; ideology or religion. Colourful gossans and sparkling ores, along with fluxes such as manganese oxide, haematite and silica (which were used to lower the melting point and viscosity of the gangue during smelting) were among the most obvious features of the ancient mining landscape. The deep brown layers of the umber and black nodules of the manganese concretions take on further significance in a mining landscape (Given and Knapp forthcoming). Mining galleries usually require pit props, and smelting needs fuel: the production of metal, in other words, requires forests, not just trees. Examination of timber preserved in mining galleries at Skouriotissa has shown that *Pinus brutia*, a species that grows particularly well on Cyprus's pillow lavas, was used most commonly as pit props (Constantinou 1992:61). Olive, oak and hawthorn were also common hardwoods in the Cypriot forests of antiquity; because they produce a long, hot burn and can be coppiced easily, they are ideally suited as a fuel source for roasting and as charcoal for smelting. The denuded landscape of certain parts of modern-day Cyprus, not far distant from the pillow lavas of the Troodos Mountains, may have resulted at least in part from four thousand years of copper mining on the island.

The relationship between mining, settlement and landscape varies according to the scale and organizational level of production (Raber 1987:301–302). Thus the intermittent small-scale, localized production of the medieval period on Cyprus contrasts significantly with the larger-scale industries and major labour