

Diogo Costa

WATER AND WAR AT PYRENEUS MOUNTAINS

HISTORICAL ECO-ARCHAEOLOGY OF LAVRAS DO ABADE



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Academic Publishing

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To my love Renata

PREFACE

The *Lavras do Abade* research is a multiple perspective archaeological study about the environmental impacts of a gold mining village in Mid-Western Brazil that was destroyed by neighboring villages at the end of the nineteenth century. According to local narratives, the conflict was the consequence of a dispute about the control and use of natural resources, such as water. However, this investigation reveals that the conflict was caused also by economic and political disputes between the villages in the region.

In this work, each stage of investigation is presented in separate chapters. Research was conducted to validate hypotheses and to combine different approaches to each element that compounds this mosaic of information. The historical documents come from primary sources in official archives and were studied with the purpose of revealing the past values of contemporaneous agents regarding development and tradition. The material culture recovered in the archeological site and dispersed in private collections was researched to interpret the everyday actions and unconscious thoughts of anonymous participants in the incident. The memories of current *Pirenópolis* residents and popular public manifestations were investigated to reveal the individuals' perceptions and group stories about the conflict. The environmental impacts of mine pollution were approached to measure the natural damage caused by the gold exploitation and to characterize the response of the *Cerrado* biome.

The result of this work is a combination of various complementary investigations into the same object, and is a theoretical and methodological referential that establishes the *Lavras do Abade* case study as an original bridge to understanding many "Water Wars" in the modern world today.

CONTENTS

1. INTRODUCTION	5
Significance of the Study.....	6
Objectives of the Research.....	7
Methodology of Investigation	8
The Organization of the Study	10
2. MINING AND CONFLICT ARCHAEOLOGY	14
Historical Archaeology Revisited	14
Multiple Perspectives in Historical Archaeology	14
Historical Archaeology Today	17
Mining Archaeology Revisited	21
Theory and Methodology in Mining Archeology	22
The Mining Feature System and Technology	24
The Characteristics of Settlement Patterns	26
Communities, Class and Gender.....	27
Mining Heritage and Research Strategy	30
Conflict Archaeology Revisited.....	31
Groups Conflict and Archeology	32
Battlefield Archaeology.....	34
Forensic Archaeology	37
Memory and Archaeology	39
Considerations about Conflicts and Archaeology.....	41
3. HISTORY OF A CONFLICT IN THE <i>PIRENEUS</i> MOUNTAINS.....	42
Mining in Nineteenth Century Brazil	42
Goiás Nineteenth Century History	44
History of <i>Meia Ponte</i> 1731-1880.....	46
History of <i>Lavras do Abade</i> 1880-1887.....	49
Preparatives to the Assault.....	53
The First Day of Attack	54
The Second Day of Attack.....	57
The Third Day of Attack	58
Results of the Conflict.....	59
Farmers vs. Miners in the <i>Pireneus</i> Mountains.....	61
4. ARCHAEOLOGY OF <i>LAVRAS DO ABADE</i> SITE.....	71
<i>Lavras do Abade</i> Historical Archaeological Site	71
Archeological Fieldwork.....	71
Methodology of Survey and Excavation	72
The Administration House: a Household Unit	74
The Store and Warehouse: a Commercial Unit	76
The Sawmill and Watermill: an Industrial Unit.....	78
Archaeological Stratigraphy and Conflict Patterns	80
Laboratory Analyses.....	81

Study of Dinnerware Sample	82
Study of Glass Bottles Sample	85
Study of Construction Materials Sample	88
Analysis and Interpretations of Material Culture.....	91
Similarities and Differences in Historical Archaeological Sites	94
5. MEMORY OF THE <i>MEIA PONTE</i> COMMUNITY	100
Collective, Cultural and Social Memory	100
Mechanisms of Time.....	100
Psychology and Philosophy of Memory	101
What is Collective Memory?	103
What is Cultural Memory?.....	106
What is Social Memory?	107
The Lost Island in the <i>Pireneus</i> Mountains	110
The Practical Alchemist	110
The Old Miner.....	113
The Handicapped Painter.....	116
The Colonel's Daughter	118
The Modern Elder	120
Collective and Cultural Memory of <i>Meia Ponte</i> Village	120
Social Memory of <i>Pirenópolis</i> City	124
Forgetting Places and Remembering Objects	128
6. ENVIRONMENTAL STUDY OF THE <i>ALMAS</i> RIVER.....	133
Ecology and Archaeology at the <i>Lavras do Abade</i> Site	133
The <i>Cerrado</i> Biome in Mid-Western Brazil.....	136
Ecological Characteristics of the <i>Cerrado</i>	136
Ecological Research of the <i>Cerrado</i>	138
Ecosystem of the <i>Pireneus</i> Mountains	140
Mining Impacts of the Nineteenth Century	142
Mining Techniques and Gold Exploitation	142
Mining Exploitation and Environment	144
Metal Concentration and Environment.....	146
<i>Archeo</i> -Environmental Research in the <i>Pireneus</i> Mountains	148
Fieldwork and Soil Analysis	148
Heavy Metal Presence in the <i>Almas</i> River.....	150
Environmental Sensibilities or Mining Patterns	152
7. CONCLUSION	157
Vestiges of an Environmental Conflict	157
Building Structures of the <i>Lavras do Abade</i> Village.....	159
Historical Landscape of the <i>Lavras do Abade</i> Site	161
Ecology and Memory of Mining Pollution.....	162
Social Memory and Capitalism Legacy.....	164
Environmental Conflicts and Water Management	165
Final Considerations and Future Directions	167
REFERENCES	171

CHAPTER 1

INTRODUCTION

In 1887, *Lavras do Abade*, a gold mining village in Mid-Western Brazil, was attacked by the neighboring *Meia Ponte* village (today town of *Pirenópolis*) for two nights and three days. According to local narratives, the village was destroyed over a water pollution disagreement. Initial research reveals substantial evidence suggesting that the area's cultural and natural heritage was not only the source of conflict related to the control of environmental resources, but instead, this was based also on economic disparities and political struggles between these two villages (D. M. Costa, 2010). If, however, the destruction of the *Lavras do Abade* mining village was the result of a “water war”, further research into this site is the most effective way to discover indications of a nascent environmentalist consciousness and results of mine pollution legacy regarding natural resources at the end of the nineteenth century in Latin America.¹ (Figure 1-1 and 1-2)

The *Lavras do Abade* historical *eco*-archeology study aims to apply a theoretical framework that includes the addition of a historical ecological perspective on historical archaeological practice, working with factors concerning the construction of collective, cultural and social memory and history of capitalism in the period of Imperial Brazil. This multiple perspective approach is the intellectual merit of the proposed study, not only for the specific area of research that is being addressed, but also to the broader fields of history, archaeology, and ecology. If we observe the most transdisciplinary works about humanity's cultural development and its variation, then the logical conclusion is that there is always a gap between descriptive reports and a more theoretically substantial objective in anthropological research. The potential contribution of this significant and innovative research to anthropological theory today is its multiple perspective regarding current natural resources conflicts,² and in the broadest possible sense, more research and debate about it actually needs to be produced.

¹ To evaluate better, see the Pacific Institute's Water Conflict Chronology project, in: <http://www.worldwater.org/conflict/list/> (last updated in 11/09) accessed in: 09/07/10.

² The United Nations Environment Programme (UNEP, 2009) published fourteen case studies of conflicts across the world that detail how violence and tension are often initiated and sustained by pressure on natural resources.

The inclusion of an ecological approach in historical archaeology is innovative, as most of the works involving environmental research and archaeology are limited to pre-historic studies. However, if we consider that many of the environmental changes have occurred in the last 300 years (since the beginning of industrialization), one may realize that the investigation of environmental changes in historic periods is a rich field of research, and today a necessity. At the same time however, the historic archaeological investigation of the spread of capitalism and the memory constructed about it, in a biome such as the *Cerrado* or Brazilian savanna, is completely singular in anthropological and historical fields. It is exclusive in anthropology because of the intention to understand human behavior in light of social remembering and forgetting processes related to the scene of a violent event. It is unique in history because of the intent to revise the documentarial history through the analysis of material culture and oral history, which reveal conflicts of agency and collective actions in the birth of capitalism at the end of the nineteenth century in Mid-Western Brazil.

This study concerns the *Lavras do Abade* historical archaeological site, which consists of feature systems of remains of gold mining exploration and a living testimony of a contention that arose at the end of the nineteenth century as a result of the expansion of capitalism in the *Cerrado* biome. Mining exploration is an enormous source of pollution that continues worldwide today, and in the context of developing countries, it adversely affects the natural resources, directly jeopardizing local communities. What this particular *eco*-archeological study reveals is a social conflict, with consequences influencing the control and management of the natural resources, both for this specific place and period and as a useful case study for all societies. In addition, only the reconstruction of a long-term event like this permits a scientific analysis of all possible causes and consequences.

Significance of the Study

The historic significance of this research is justified firstly by the singularity that this site represents in the context of world history: an industrial enclave in a rural economy. Secondly, the foreign nature of the entrepreneur, and the capitalist character of the enterprise, signify important transformations that occurred not only in the region in question, but also across all of Latin America. Third, the study of transformation in the period of the late nineteenth century and beginning of the twentieth century demonstrates a rich space for the counterpoint and construction of Brazilian historiography.

The archaeological significance of this study is unique, because of the possible patterns of material deposits referent to human conflicts in this site. The archaeology of historical mining sites has much to contribute to understanding contemporaneous issues today, such as the ecology of human industrial explorations and settlements, drastic economic alterations of the environment due to water and mercury used in mining processes, and complex political and social relationships inside mining societies and in their vicinities.

The ecological importance of this research is equally significant. Aside from examining a possible conflict over control of environmental resources, the major significance rests in the location of these events. The *Pireneus* Mountains are situated in the geographical watershed of the Amazon and *Platina* hydrographic basins and contain the primary spring which feeds two important state waterways, the *Almas* and the *Corumbá* rivers from the *Araguaia-Tocantins* hydrographic Brazilian basin, in the middle of the *Cerrado* ecosystem (Goiás, 2005).

The anthropological importance of this study is considerable because the site concentrates values of collective and cultural memory of today's community: a place of remembering and forgetting. This gives important insight into the ways that cultural and natural values are consolidated and utilized as an instrument of heritage valorization and educational promotion in the region. Additionally, the site offers an exclusive perspective on water sustainability and environmental resources policy, which have involved all levels of society including civic government, community and private stakeholders.

Finally, the research promotes activities to evaluate, defend, maintain and study the archaeological elements in the site. Additionally, the elements can be prepared for their adequacy for museum and tourist use, with the application of one administrative program and a set of procedures to create a cultural park (D. M. Costa, 2003).

Objectives of the Research

The general objective of this research is to serve as a survey of real causes and consequences of this event, using primary sources, such as historical, archaeological, and environmental data. The major theoretical significance of this project is its contribution to the establishment of a multiple perspective and historical *eco*-archaeology through one set of interesting paradoxical circumstances provided by this remarkable case study.

The research question is: Was the *Lavras do Abade* conflict an environmental *water war*? Three theses are identified in this research study to answer this question: (1) yes; it was

an ecological fight because of the use and abuse of natural resources; (2) no; it was a case of economic disparity between a miners' village and a farmers' village; (3) no, it was a political struggle between patronage local power and a private foreign entrepreneur.

The analyses of data followed a general strategy of formulation and a test of theoretical propositions within the collected data. The hypothesis formulated to answer the general research question stated that the extreme actions were caused by not equal sum of all factors. In this way, and in the case study of the goldmine village of *Lavras do Abade*, the destruction was caused not by the equal sum of all three factors: ecological, economic and politic; or not only because of one exclusive factor such as ecological. The destruction was result of the primary combination of two factors such as economic and political, and with addition of a third element ecological, which had a differentiated weight according to the each social segment and historical situation.

The hypothesis was tested in the following methods of the data analysis: examination and comparison of historical documents in the National Archive of *Rio de Janeiro*; interviews with old residents in *Meia Ponte* village, today *Pirenópolis* city; analyses of archaeological vestiges at the *Lavras do Abade* site; and measurement of heavy metal pollution in the soil samples of the *Almas* river area.

Methodology of Investigation

The main justification for the on-site, empirical research was the collection of primary data from many sources regarding the *Lavras do Abade* conflict in Brazil. Empirical research is the most effective way to conduct a scientific exploration through coordinated and integrated actions that reflect numerous theoretical elements in this research study.

A series of standard procedures was applied in testing the theoretical propositions about the conflict and linking the data to conceived hypotheses about the event. The procedures were historical investigation of primary fonts about the conflict, archaeological excavations in the *Lavras do Abade* site, interview with eldest residents of *Pirenópolis* city, and soil collection from the region of *Almas* river. The compilation and explanation of this primary data was important because of the inductive character of this research and the necessity of comparing with deductive models proposed about the *Lavras do Abade* event. In this way, the utilization of multiple procedures helps to identify and characterize different cultural and natural data sets, as well as to interpret from multiple perspectives the data about the incident and to auto validate the quality of the research by the results comparison.

The specific strategy for the *Lavras do Abade* case study analyses was based on pattern-matching logic and the explanation-building process. The pattern-matching logic and the explanation-building process compared the empirically based historical, archaeological, and environmental patterns with the predicted ecological, economic or political rival explanations. The findings in their turn revised the initial propositions and combined other explanations for the event, following a chain of evidence and establishing a case study database.

The research has been carried out since 2003, and by three phases, one completed in the summer of 2007 and supported by the Charles Wagley Research Fellowship administered by the Department of Latin American Studies at the University of Florida; a second conducted in 2008 and supported by the Brazilian Council of Technological and Scientific Development – CNPq; and the third in the summer of 2009 and supported by personal funding.

The first phase synthesized and characterized the historical events through historiography analyses in primary sources at the National Archive of *Rio de Janeiro*. The archive accumulates a variety of institutional and personal documents of the CMG Company that was responsible for gold exploration at the *Pireneus* Mountains during the period from 1880 to 1887. This dataset is made of more than 300 pages of corporate documents, personal letters, official documents, newspaper clippings, pictures, and employee testimonials about the conflict.

During the second phase, oral historical data was collected through focused interviews with the oldest inhabitants of *Meia Ponte* village. The interviews provided the most effective way to recover discourses about the *Lavras do Abade* conflict, as well as to make it know to the local community. Besides the compilation of this ethnographic data, archaeological investigations were also executed on the site, composed by the excavation of sample units in the place. Fragments of pottery, glass, metal, and ceramic were collected, and all material was analyzed in a laboratory.

The third phase focused on ecological studies, with the collection and analysis of soil samples to measure the level of heavy metal pollution in the area. The soil samples were collected in the *Lavras do Abade* site, *Barriguda* creek and *Almas* river, including the town of *Pirenópolis*. The selection of study area locations was defined to be the best way to identify the trajectory and distribution of mining pollution between the two villages.

The Organization of the Study

The study is divided into seven chapters, each chapter representing one facet of research. In the Chapter 1, a little introduction is made on the subject; in the Chapter 1 the significance of the study is presented, the objectives of the research, the methodology of investigation, and the organization of the study. The goal of the Chapter 1 is present the scenario of this research and what questions drive it, and how the questions are answered.

The Chapter 2 consists of the bibliographical review of Mining Archaeology and Conflict Archaeology. In the revision of the mining archaeology literature, firstly, the theory and methodology of this kind of archeology is discussed. Secondly, the mining feature system and the characteristics of mining settlements are presented. In conclusion, aspects such as communities, class and gender are referenced; followed by the reflection about the mining heritage and research strategies. In the revision of conflict archeology literature, firstly the characteristics of conflicts perpetuated by humans groups is discussed. In sequence the methodology of battlefield and forensic archaeologies is presented as subside to the study. At the end, considerations about the right of memory and conflicts in archaeological studies are made.

The Chapter 3 involves the historical context of conflict in the *Pireneus* Mountains in which, first, the historical development of mining entrepreneurs in the hinterland of nineteenth century Mid-Western Brazil is presented. There is then a description of the history of a fight in the region of the *Pireneus* mountains; firstly with a panoramic about the history of *Goiás* province in the nineteenth century, and secondly, with the historical particularities of both protagonists, the *Meia Ponte* and *Lavras do Abade* village. The history of the *Lavras do Abade* conflict is detailed through use of historical documentation and discourse analyses in the following sub-items. The Chapter 3 culminates with a presentation of the historical results of the conflict.

In the Chapter 3, the historical documents were compared with the *historiographical* production about the period and later interpreted with application of discourse analyses. The objective of the Chapter 3 is to illustrate the historical context of the *Lavras do Abade* event, to understand the mine organization and operation, and the particularities of a nineteenth century mining foreign capital enclave in an agricultural and pastoral economy. This study was necessary to invalidate the environmental fight, and to validate the thesis of economic disparity and political struggle through the analysis of discourse present in historical documents and historiography about the event in the Brazilian imperial period.

The Chapter 4 is the archaeological investigation of economic disparity, a detailed description of the *Lavras do Abade* archeological site, followed by the description of the archaeological fieldwork realized. The objective of the Chapter 4 is the recovery, analysis, and interpretation of archaeological deposits and structural remains of the *Lavras do Abade* site. This study was necessary to validate the economic disparity thesis through the comparison of wealth of archaeological artifacts from the site, and the political struggle thesis through the study of these artifacts in today's *Pirenópolis* society, and the spatial organization of building structures.

The Chapter 4 also presents the analysis of archaeological deposits at the site, through the interpretation of the finds in comparison with the results of spatial artifacts and structures. In this section, the three investigative units of the site are presented: administration house, store and sawmill, as well as the reflections about the archaeological stratigraphy of the site and the expected patterns to a conflict area. The Chapter 4 sequence is a description of the laboratorial analyses of the recovered vestiges of the material culture; here the ceramic, glass, metal, and roof tile are studied and socio-economically interpreted. The Chapter 4 ends with a comparative archaeological study of the similarities and differences between the old *Meia Ponte* and *Lavras do Abade* sites.

The Chapter 5 contains the oral history and memory discussion of a political struggle. In the Chapter 5, the memory studies regarding the remembering and forgetting actions related to the conflict are investigated. Firstly a brief presentation is made about how memory serves as a time mechanism for societies, and about the psychological and philosophical aspects of the memory. Secondly the theory of the collective memory is discussed and applied in the interviews conducted with the eldest residents in the town of *Pirenópolis*. Following this, the cultural memory paradigm is presented and also used to interpret the same interviews about the conflict. Next, the importance of memory to society is portrayed and its real exercise is presented through the study of a religious phenomenon from the old *Meia Ponte* village. Finally, the aspects of forgetting places are discussed, with the demonstration of material cultures working as physical memory in the town of *Pirenópolis* today, and the characteristics of the *Lavras do Abade* site as a theater of memory is analyzed.

The Chapter 5 is also an oral history study; conducted through a series of questions and through the subsequent analysis of responses. The objective of the Chapter 5 is to study the location of remembering and forgetting in collective and cultural individual memories, and furthermore to capture perceptions about the conflict heritage in the social memory of the population. This study validates the political struggle and the economic disparities thesis

through the value attributed by interviewers and by the population to the collective, cultural and mainly social memories related to conflict today.

The Chapter 6 is the environmental investigation of historical mining pollution in the *Cerrado*. The objective of the Chapter 6 is to produce a survey of ecological history in the region, and to present the environmental impacts of historical gold mining exploration in the area. This study was necessary to invalidate the environmental fight thesis through the identification of pollution levels collected in soil samples and through the indices of mercury levels discovered in the soil samples of the region.

The Chapter 6 proposes to understand the environmental impacts of gold mining exploration in the *Cerrado* biome at the end of the nineteenth century in Midwestern Brazil. Firstly, the *Cerrado* biome is described according to perceptions about the ecological characteristics, ecological researches conducted, and mainly according to the ecosystem of *the Pireneus* mountains. Secondly, the historical mining impacts are presented through reflections on the mining techniques of gold exploration, and through the environmental consequences of metal concentration in the area. Finally, the *eco*-archaeological study of the soil samples from *the Almas* river area is demonstrated, as is the interpretation about the emergency of pollution patterns.

The Chapter 7 marks the conclusion of the research. Here some thoughts about the research and its results are made. Firstly, the archaeological work findings are discussed, along with their validation or not according to the conflict and mining archaeology backgrounds. The building structures of the site are analyzed through different perspectives as well as the historical landscape of the site which is also broadly interpreted. Secondly, the ecological and memory studies are evaluated mainly through the pollution legacy and the memory constructed from it, but also through the problems of water management and the consequent conflicts. Finally, the conclusion reached is that the *Lavras do Abade* conflict, more than an environmental fight, is observed as an economic disparity and as a political struggle, and also, to a great degree, as a social movement.



Figure 1-1. *Lavras do Abade* site – national location.

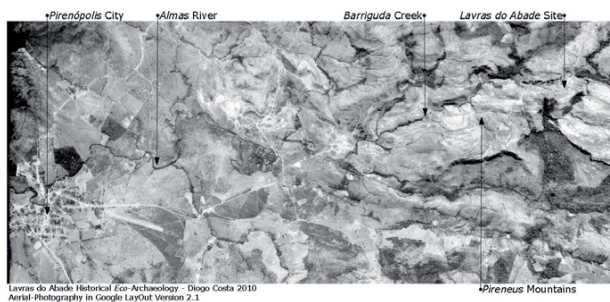


Figure 1-2. *Lavras do Abade* site – regional location (no scale).

CHAPER 2

MINING AND CONFLICT ARCHAEOLOGY

Historical Archaeology Revisited

The construction of Historical Archaeology could contain numerous stages, since the multidisciplinary definitions until the interdisciplinary approaches. Yet the first question remains: why practice archaeology when there are other sources of historical information about the same period? Looking for this intersection, many archaeologists believe that the study of material culture in historic periods simultaneously complements and contradicts other historical sources, such as written, oral or pictorial. Many labels¹ were created to share this historic division in the science that existed prior to the archeology, social, and human sciences. During the nineteenth century construction of modern knowledge, the main point of contention concerned the separation of the “truth of faith” and the “truth of science.” The separation occurred after the promulgation of evolution theory, which, while revealing that “the man comes from the monkey” established a new perspective by which to see the world, wherein reality is not merely a total and immutable present, but a sometimes chaotic and dynamic construction of the past (Andrén, 1997).

The evolutionary perspective has been applied to various forms of science, although it is not until Thomsen’s work in typological studies and Lyell’s work in stratigraphic studies that archeology is separated from history to create a new field. At the same time, changes in the fields of geology and biology also contribute to the decadence of textual history – history based only and absolutely in written sources. The empiric specialization of science also occurs during this period, granting each field of knowledge an absolute study object resulting from their own discipline constructions and the segmentation of academy. In turn, archeology was restricting as a science of the antiquarian, grounded in a material perspective provided by its strong relationship with fieldwork (Andrén, 1997).

Multiple Perspectives in Historical Archaeology

Historical archaeology is an exercise of construction of the past while at the same time is a deconstruction of the present. In this perspective, the archaeological study of a modern

¹ Such as: “Pre-history laboratory” (Shuyler, 1978), “handmaiden of history” (Deagan, 1982), “illegitimate son of archaeology and history”(Hodges & Whitehouse, 1983), “poor cousin of Pre-history” (Little, 1994).

or even a contemporary past is, according to Andrén (1997), rooted by five statements that found the necessity of material studies about documented periods.

To Andrén (1997), the first statement is the necessity of literally touching the past, and in this case the material culture assumes the position of architectural study when the concrete observation of buildings or constructed spaces is the only way to understand the style. This understanding was born with the work of Leon Battista Alberti and the documentation of Renaissance architectonic style. In this perspective, the stylistic model (romantic, neoclassic, modern) is not so important, but the stylistic sense (internal and external) is. In the case of archeological studies, the ethnic proportion of the building is also relevant. The aesthetic tradition is further represented by Napoleon's act of transporting physical elements of Egyptian culture to France and introducing the Egyptian style to Europe. The field of restoration and reconstruction, practiced principally in the United States, is another way to reinforce the necessity of material studies in documented periods, when the knowledge about the building is only accessible through archeological excavation.

The second aspect that follows Andrén (1997), is the necessity of understanding the written word through philological study. Since the second half of the nineteenth century, the archeological works of ancient cultures of North Africa, the Middle Orient and Central America have provided innumerable resources to understanding extinct languages. The cuneiform plaques, Hindu inscriptions, and hieroglyphic contexts are absolutely relevant to the philological studies. On the other hand, Classic Archaeology originated in the search of textual contexts; the Greek and Latin languages were understood by being associated with archaeological contexts that reveal the underlining of texts and significance of words. Another example of importance of material studies in documented periods is the numismatic work, which with comparison of coins and values found the exchange rate between cultures and societies. Utilizing the same process of comparison, the studies about the Indo-European language would only be effective by means of the archeological findings of relationships between names and places, mainly in cemeteries.

The third aspect revealed by Andrén (1997) is the condition of material culture in support of memory, or in support of the historic value of objects, as in the case of archaeology, the vestiges. Since the Greek historian Herodotus, the material culture has been an important element in the historical reconstruction. To Herodotus, the history was divided into "event" and "monument" where the event is the historic fact in time, and the monument is its concretization in space. During the middle ages, artifacts acquired another value, not only as a representation of ancient facts, but also as an illustration of different cultures; the

“Curiosity Cabinets”² in the castles and churches are the best example. The nineteenth century, as we see above, tries to disconnect the written history and the objects in an artificial way of specialization of knowledge. However, with the movement of the Annales School in the middle of the twenty century, this disconnection is deconstructed and more “documents” are associated with the study of the past, such as with landscapes, institutions and cultures. The major argument of raising new critiques about the written source was that the written word was an elite code, from and to the elite, and that the subordinate segments of society were only accessible through other “historical” sources.

The fourth aspect of material studies presented by Andr  n (1997) is the possibility of the ethnography of objects. This anthropological approach originated in a field exercise which demonstrated that not only the participative observation and discourse analysis are “informants” of social practices, but also the material culture. Anthropology acquires real power as institution at the end of the nineteenth century, when it becomes useful as a colonial instrument. If the informant that was observed or interviewed is automatically identified as the “author,” the object studied (mainly archaeologically) is from “anonymous” production. First created by Hildebrand, the term “material culture” obtains a valid anthropological significance when it is applied in the anthropological studies of relationships, myths and costumes. Finally, according to Andr  n (1997), the fifth aspect of material culture studies in documented historic periods is, obviously, the archeological aspect, but in this case as an laboratory to analogy between the pre-History and history. This perspective passed on since the construction of a historical ethno-archaeology until the works realized by Rahtje and Murphy (1992) and Shanks and Tilley (1993) and, who developed the “garbology” or rubbish archeology and “beer can typology”, respectively.

What all these studies have in common is the search for a structured methodology of material culture analyses, and in the case of documented periods, a more refined technique. Similarly, modern written documents have experienced changes, with the postmodern concepts of science (return to multi and inter disciplinary), the history of gesture and body (cultural history), the development of oral history (as primarily font) and the electronic revolution (hypertexts). Meanwhile, it is necessary to understand not only why on must continue important archeological studies of even “well” documented historic periods, but also how these studies are carried out in a contemporary world.

² The curiosity cabinets were encyclopedic collections of objects in the Renaissance Europe, going from the more exotic, such as mermaid skeletons and religious relics to mineral samples and painted portraits.

According to Orser (1996), historical archaeology has been divided into three aspects: the study of a time period or natural sequence of prehistoric studies about the written societies; a research method or a type of source of information to complete the literate cultures; and the study of the modern world through a multi and interdisciplinary field that shares a special relationship with the formal disciplines of anthropology and history that seeks to understand the global nature of present life. In these aspects, objects in the present are more than aesthetic concrete models, or material support to the written history, or physical remembrance of the past, or substantial representations of culture, or elements of physical analogies, according to Andr  n.

The artifacts are the raw material of historical archeological studies because each artifact has innumerable values as time-space capsules. In fact, the objects are material things that represent ideas, but also create ideas for us about ourselves. The material culture has a dialectical condition of passive and active conforms to Gordon Childe's vision (Patterson & Jr., 2004).³

In Orser's method (1996), historical archaeology can be defined as science that works with contemporaneous groups that do not have other records, apart from their material culture. This position represents the capacity of the historical archaeologist, even with the difficulty of global analyses, to guide their research questions by multi and inter disciplinary broad terms. The employment of multi and inter disciplinary concepts is not only a research strategy, but is also the consciousness that we live in a worldwide system, manifested from both a synchronic point of view, and through a diachronic perception about its formation. A world system with both material and spatial expressions is the key for understanding the process of creation, dispersal, and consolidation of this "Western mentality" in contemporaneous world. Or, according to Orser (1996): "think globally, dig locally"...

Historical Archaeology Today

According to Kelly (2005), historical archaeology has become the fastest growing field in the last decades, but this growth carries an indeterminism about what historical archaeology should accomplish. In complementing it, according to Little (2007), historical archaeology still suffers a duality between being a more anthropological social science or a more historical human science.

³ "He also expresses optimism that archaeologists can do more about material culture than just its use" (McGuire, 2002:102).

As an anthropological social science, historical archaeology seeks to investigate, describe and explain human behavior, which goal is to reconstruct people's way of life. Reconstructing ways of life is to describe food ways, settlement pattern, domestic life, economic relationships, social structures, and worldviews of past cultures; all this helps to explain regional and global processes such as colonialism, capitalism, and slavery.

As a historical human science, historical archaeology seeks the knowledge and the understanding of the human condition, with the goal of supplementing and challenging the history that we recognize through documents. Besides using documents and historic methods, rewriting documental history means providing numerous alternative questions and interpretations to history through material culture. Therefore, to both authors, the diversity of approaches is a healthy addition to the discipline from a relatively recent common origin.

Historical archaeology was born as a sub-field of archaeology, with an explicit and specific object. Historical archaeology in America began at the end of the nineteenth century, through the works of Felix Martin in Canada and James Hall in the U.S. However, these works did not have a scientific method or specific theory, instead prioritizing studies about famous people and notorious places for the national and official history. Since work evolved at Colonial Williamsburg and Jamestown,⁴ historical archaeology has been focused on the identification of architectural remains or on the collection of artifacts aimed at refurbishing sites associated with "great persons" or "great events".

For years, archaeologists have insisted that historical archaeology was an "auxiliary science to American history," as defined by J.C. Harrington (1955). With these examples, we have the work in Signal Hill, as others, where a fort was a stage for archaeological architectural research with the objective of establishing data about the size and shape, for future reconstruction.⁵

⁴ The excavation of Williamsburg and Jamestown included the refurbishment of eighteenth-century buildings and rebuilding colonial houses in the historical town center during the 1920s and 1930s, using archaeology to guide the reconstructions.

⁵ Noble (1996) talks about the conflicts in the "restoration archaeology" and how archaeologists have the position to see the needs and what can be done in this context. Archaeology has the power to make substantive contributions to reconstructing both behavioral and physical aspects of the historic past. For example, the author writes that this raw material is provided when archeologists visit historic sites in search of what preservation professionals calls "authenticity," and then interpret it to the public. For the author the historical archaeologists have a distinct advantage over pre-historians, because they are not wholly dependent upon the archaeological record or analogy for our interpretations; however for some reason it is difficult for historical archaeologists to establish the fact that they can learn something new and important through excavations, especially because they are come ever closer to the present in their research. However for revert this the archaeologists need begin to take a hard look at what it is they do, and determine what is really important, and what is the focus research.

However, the watershed occurs with the redirection of focus about the “people without history” and the movement away from the Anglo-American world, which developed new perspectives to monolithic questions. It was with accidental finds like that of Adelaide and Ripley Bullen (1945), when objects discovered during the excavation of African-American homes contradicted documents about the same historical person. With this work, historical archaeology could no longer simply confirm facts in official history, but began to raise questions and to examine values about the registered past in the documents, written with other sources of information.

In the following decades, many distinct theoretical orientations emerge in the field of historical archeology, such as, the work of Noël Hume (1969,2001), an important historical-culturalist in the 1960’s, Stanley South (1977,2002) a processualist and the only historical archaeologist knighted by Binford (Thurman & Binford, 1998) in the 1970’s and James Deetz (1977,1996), who ahead of his time, worked with cognition, mentality, structure and symbolism.

Hume (2001) shows us the importance of the object of study, not only to differentiate historical archaeology from other archaeologies, but to characterize and re-signify the investigative exercise of historical archaeology. Hume employs a characteristic historical approach that defines historical archaeology as more of an art than a science in determined contexts. However, objects are not the only absolute data to archaeological historic research, but as revealed by Little (2007), all the materiality of space in the historic period. Following this perception, today’s historical archaeology works with a broader view that includes a perception of a world system, and when the historical archaeological site compounds a more global enterprise.

Therefore, the systematic method to working in a historical site is first presented by South (2002) in 1970’s, as a goal to imply a minimum order and to demonstrate a pattern of regularities in the archaeological record. According to South, the strategy to research a historical site is first conducted by the theoretical opinions of archeologists. In an explicitly process-based point of view, South speaks to the necessity of constructing testable hypotheses about the object of study, and to the laws that could emerge from this practice.⁶ Nevertheless, South contradicts himself when he admits that the empirical character of archaeological investigation could also change the course of study, and could generate new

⁶ “Testing theories about past cultural systems to build better theories is the major goal of archaeology” (South, 1977b:02).

approaches to conducting the research. In brief, South's extremely functionalist point of view is reinforced by application of numerous forms and calculi to create a common law among historical archaeological vestiges, and to create a common law that does not differ from a pre-historical approach perpetuated by Binford's thought.

To South (2002) then, historical archaeology does not differ from other archaeologies, despite its object of study. Yet to Deetz, (1996), the difference between archaeology in general and historical archaeology, specifically, is substantially deeper than South's perspective. According to Deetz, the historical archaeologist's approach to artifacts differs from the pre-historian's, because the historical artifacts are vastly more diverse than pre-historical artifacts in terms of the materials from which they are made and their place of origin. Deetz's approach explores more idealistic concepts, including the change of mentality from a Medieval to a Georgian perception of the world.

However in the 1980's, new approaches such as post-processualism guide historical archaeology towards critical thinking, which raises questions about who created the past and for whom was the past created. This new approach converges into a multi and inter disciplinary point of view in the study of the modern world formation. The methodological approach, as much as the theoretical definition, has changed with the incorporation of new paradigms in historical archaeology.

Shackel and Little (1992) discuss the post-processual approaches in historical archaeology that explore the active and symbolic nature of material culture, when the archaeological record is viewed as a text to be decoded and the relations of power and domination are viewed as a group of conflicts. Shackel and Little present some scholars whose works have been most influential in the development of a post-processual historical archaeology, such as: Anthony Giddens and Mary Douglas, Pierre Bourdieu and Michel Foucault. In conclusion, Shackel and Little note that the post-processual approaches do not avoid general law and remind us that the vocabulary of post-processual archaeology is not fixed; it should be understood by those performing post-processual archaeology that it is not ready to be standardized and formalized, but is a construction process between the applicability and hypothesis.

According to Kelly (2005), the increase of researchers in Latin America, Africa, and the Pacific brings new and important perspectives in theory and methodology to world historical archeology. The multiplicity of research sites is also another factor of development in historical archaeology investigations. This variability shows the diversity of approaches and questions as conducted by archaeologists today, as well as the environment. Mrozowski

(1988) suggested that historical archaeology can be more than a social history that relies upon material culture as one of its primary sources of data for a cross-cultural applicability, over both time and space. For Mrozowski, the multi and interdisciplinary approaches to which historical archaeology can make important contributions are about world urbanization and environmental history, and in the last instance, in the rise of complex societies and the origins of the state.

In this way, Mrozowski (1988) proposes looking at some of the factors which have influenced land use practices in urban communities and what the archaeological ramifications of those practices have been, such as: urban land use or the relationship between space and the forces which influence its utilization; the differences between spatial division practices as they reflect the labor, and sanitation and health that characterize urban communities. For Mrozowski, employing a multi and interdisciplinary approach by historical archaeologists can lead to examining the evolution of urban society in a global perspective, and exploring new questions about social and ecological processes in these communities, as the key to historical archaeology's future.

Mining Archaeology Revisited

Mining archaeology is not an epistemological revolution in archaeology, as it has numerous study cases, though unfortunately often limited only in descriptive aspects, but that are also a representation of why the research is conducted today. As a short example, I will present three works of archaeological study cases conducted in the mining sites of 19th century in Australia, United Kingdom, and the United States.

Bell's (1987) study is a classic report about the mining sites in the central Palmer district of Australia. Starting with a historical review in the area, the major part of this work is a description of eighteen sites, with specific history and little interpretation of archaeological remains. In conclusion, the book presents a simple contrast between the technology employed and the state of preservation of each study's mining sites.

Jones, Walters, and Frost's (2004) work, on the other hand, is a large review of the mining sites in mid and north-east Wales, in the United Kingdom. Starting with a presentation of methodological aspects employed, the work also presents a geological and historical background, beginning with pre-history and ending with the industrial era. Unfortunately, the work is not very different from others, providing an exhaustive description

of fifteen mining sites in the area. As a conclusion, the final section again highlights the management and conservation problems of the mining sites.

Davis's (2005) case study of the mining sites of Nevada in the United States, is a more emblematic work. The book is a compilation of four descriptive chapters about the archaeological remains found in the mining sites, employing drawings and lists of each artifact. The author's overemphasis of details, however, diminishes the conclusion.

As typical examples of many archaeological reports, these works are merely a compilation of technical information and descriptive interpretations of mining sites. On one hand, these types of works characterize the majority of archeological reports on mining sites; while on the other, the gap of more theoretical substantial objectives is also a constant. As such, a principal question that needs to be made in any archeological research about mining sites is: why do this research?

One possible answer is because mining sites provoke drastic alterations in the environments that are implanted, such as trough water and mercury use. In this way the environmental impacts, or the natural surrounding transformations in which the mining society finds itself, may be the final goal of the research. As such, historical archaeology of mines may contribute to contemporaneous issues, as does the ecology of human industrial exploitation settlements and its environmental impacts: "We can see the changes in the landscape and the environmental consequences of mining..." (Baxter & Allen, 2005:73).

Theory and Methodology in Mining Archeology

Mining archeology is not vastly different from other "thematic" historical archaeologies, but it incorporates theoretical and methodological approaches applied through a singular and restricted field of research. I intend to present here some insights about this particular type of industrial archaeological site, and to present according to several perspectives, a broad view of these specific objects of study. The theoretical and methodological approaches offered here do not have the intention of exhausting the topic, but rather hope to provide a panoramic comprehension of many aspects that are frequent and possible in the common mining archaeology studies.

In the case of an "Archeology of Mining," it is necessary to first present the theoretical and methodological orientations for which the discussion about the limits and regularities of these kind of archaeological study remain the main objective. According to Knapp (1998), the use and exploitation of metals is a constant in all human societies, regardless of the time

or the space in which it occurs. It is necessary, therefore, for the scope of this study to select only the archaeological remains of mining activities close to the 19th century.

So, according to Hardesty (1988), regarding the specificity of historical mining areas. "Standing buildings, machinery, and landscape feature often are monumental in scale..." (Hardesty, 1988:17). On the other hand, according to Knapp (1998), the study of mining reveals a great diversity of approaches, represented in general terms by historical archeologists focused from the history and technology of mining to the mining settlements and communities, that include: gender, power strategies and labor exploitation, imperialism and colonialism on the mining frontier, production and social reproduction, class conflict and mining heritage.

Therefore, this enormous and varied characteristic of the study of 19th century archaeological mining sites is essential to introducing other aspects about the universe of research. First, according to Hardesty (1988), in the case of mining sites, it is theoretically possible to make a distinction of three types of sphere or research levels, defined as: material, population and information spheres. When each of these spheres provide some kind of archaeological knowledge, it is possible to interpret the internal and external social relations and technology employed in the mining space.

The material sphere can be characterized as the network of transposed materials that are consolidated between the frontier and the heartland; this web of objects consists of any type of supplies for supporting the mining operations, such as equipment, tools, food and others resources not produced in the mining space. Consequently, it is necessary to keep in mind that, in this material sphere, there is a singular difference between the local production and the external production. Like this, what is preserved in the archeological records, as such bottles and cans, can usually give us information about the manufacturer rather than the distributor, demonstrating that this interaction between spheres can be made at different scales and levels.

The population sphere is about the migration movements linked with a majority system when an enterprise is established in some place. Here it is possible to identify both local and external worker, temporary and permanent employees, ethnicity, age and gender. The archaeological definition of household⁷ is based mostly upon artifacts, that are specific indicators of gender and age, such as toys and decorated ceramics; upon activity indicators,

⁷ According Gilchrist, 2000 household archaeology is concerned with the life cycles of individuals and the development cycle of households (King, 2006:299).

such as objects related to blacksmithing or sawyer; upon differences in economic indicators of articles in the household assemblages; and upon differences in the ethnicity assemblages diversity, through material culture.

At last, the information sphere talks about ideas and symbols, through telegraphy and railroad for example, that create a type of transmission of technical information. According to Hardestey (1988), Victorian culture is the best ideological documented transportation system for the mining frontier, emerging as an industrial social order of the 19th and 20th centuries, which brought the rise of industrialism, urbanism, and large corporations. The archaeological record of Victorian culture is most visible in the layout of settlements and trash dumps.

In the sequence, as methodological practice in the mining historical archaeology, Hardestey (1988) argues that beyond the archaeological record there are many types of other documental records about mining sites that can be explored, such as: maps that give important information about the town layout, as well as the use and construction of buildings; geological sources, which are useful sources of information about ore deposits; company records, libraries, archives, museum; diaries and personal reminiscences, accounts of travelers or workers; government records, detailed records that contains different kinds of information: identification records, status records, case records and legal records; and pictorial documents are quite common.

Therefore, given the theoretical and methodological general approaches that we can bring to archaeological mining sites, it is necessary to ask: what are the particularities of these sites, and what are the inherent characteristics that define mining sites from others?

The Mining Feature System and Technology

On the one hand, following Hardestey (1988), the static record of mining sites is about the archaeological observations of mining “things” such as the remains of buildings, trash, dumps, and machinery and their arrangement in three-dimensional space. These elements can be grouped in different features that form the archaeological signature of any given mining space. The principal, archaeological record is the feature system, which can be defined as a group of archaeologically visible features and objects that are products of specific human activity. Identification of the feature system begins with documentary accounts of the form and activity of mining. Primarily, the feature system may include archaeological features that are widely dispersed geographically. The activity locus and the feature system, however, are related as analytical units. In practice, the feature system is the

historical site equivalent of the activity locus in pre-history, but it takes advantage of the documentary record that tells us about the place form and activity.

Normally in a mining site, formation and structure are composite, and there are some particularities, making it necessary to classify and define their resources. The horizontal stratigraphy in the mining camps, for example, tends to be separated into geographical clusters, each representing a different period or component. Another factor that occurs in mining studies is the mutilation of these components, because the structure of mining sites must be viewed as discontinuous surviving remnants of multiple occupations and feature systems, and not as a continuous accumulation of historic debris. Another particularity is that of underground structures, which can be reconstructed from surviving archaeological “fragments” – drifts, stops, raises, shafts, and other deeply buried feature from the earlier mining events. The remains of mining technology are the most visible feature in mining sites. Textbooks tend to describe basic industrial processes and equipment without regard to the “appropriate” technology that was actually used in many mines. The archaeological record does contain information about these adaptive variants. Therefore, it is not about the composition of mining sites, but rather their explicit function that we found as the principal characteristic, thereby separating the mining sites of another’s industrial archaeological remains: the ore exploitation.

In this way, the technology of hard rock mining for the extraction of the ore varies from simple hand tools to more complex industrial machines. The process includes the tools, equipment, and labor for removing the ore of the rock, taking it to the mill, crushing the ore rock, extracting the precious metal, and dumping the waste products. Understanding the technology requires the identification of the “total system.” The system is sometimes visible in documents that describe the technological process as it was planned or how it actually worked at one time or another. Mining technology is also visible as a network of observable features and artifact assemblages in an archaeological site, ranging from mineshafts, head frames, and engine pads to mill foundations, crushing machines, mill tailings, and tramways. However, an archaeological site is not the surviving remains of a single technological system or process. Rather, it is made up of several technologies that reflect how mining changed over time; the buildings and machinery from earlier processes may be left in place as new processes are added.

The hard rock mining feature system and the technology of anywhere mining is closely related to the geology of the ore deposit. There are two technology patterns of mining according to the place and the ore deposit. The technology varies from small “low tech” hand

powered tools such as pans and bateas, rockers, sluice, long toms, and dry washers to large “high tech” mechanical hydraulic system, dredges, power shovels, and scrapers. However, the mining process is not the only technological process by which to trace legacies in the mining site. The milling feature system also occurs after the ore was mined and the metals were extracted. The milling process, which often is carried out at or near the mining site, is dependent upon the type of metal extracted. In all cases, milling began with mechanical crushing and grinding of the mining ore, to free metal particles which then could be collected easily, using a variety of devices such as copper plates or tables covered with a thin film of mercury. On the next stage, the assaying is used to monitor both mining and milling processes.

The Characteristics of Settlement Patterns

In addition to the mining technology employed for the extraction of ore, mining settlements are also revealed in the works about mining sites. Representative of an area of habitation, settlements were comprised of dwellings and associated private and communal facilities, perhaps surrounded by associated fields, paddocks, approach ways and others features, together form the living place for the inhabitants of these mining sites. Bell (1998) presents three characteristics that distinguish mining sites from others industrial sites: first, mining sites are located where the minerals are; second, they provoke an economic impact in the region in a very short time; and third, and fundamentally, the settlements are ephemeral in nature. Mining settlements can be separated into two types: the alluvial, non-prosperous settlements inhabited primarily by males, where tenure was short and material goods were limited and underground mines where the population is more evenly gender-balanced, including a fair proportion of married couples with children, and with a more stable domestic economy.

Settlements remain the focal point of research on social information about the mining site. Small, short-lived settlements, for example, are unlikely to be included in the usual documentary sources of demographic information, such as the federal population census, tax assessment rolls, and city directories. However, the size, age, and gender composition of such camps are more visible in the archaeological record. Therefore according to Bell (1998), small, cheap and standardized houses can also indicate that mining was somewhat prosperous, the cost of materials and specialized work was also high, due to the high demand for labor and an increasing population.

One needs to keep in mind that identifying a household is not easy in mining settlements, as the site of a house is not necessarily a household. This must be considered as a group of people sharing domestic activities such as consumption and production, or ideological rules and strategies that are part of a large cultural process, such as adaptation. According to Bell (1998), the activities that most characterize the mining household can be identified as: Co-residence activities, whereby all members live under the same roof; Distribution and consumption activities for the same people who distribute and consume wages, food, and others materials, though a separation of activities may be visible only in the archaeological record, where the two localities have quite different archeological assemblages; Production activities that are strongly related only to the morphology of all-male boarding households; and Reproduction and inheritance activities that provide a social context within which personal possessions, names, or anything else could be transmitted from generation to generation.

Besides this, we can find two additional factors for the formation of settlements: ecology and technology, because mining settlements are found only in the vicinity of ore body. To some extent, the geographical pattern of settlements in mining district is structured by the geology of the ore body. On the other hand, the link between ecology and the mining community is the technology. Like this, the mining technology is problem-oriented and severely limited by geological and economic constrain, which directly reflects the mining settlement patterns.

The geology of ore bodies and the related engineering problems associated with removing the ore and separating the metal from the gangue allow for a limited amount of variability in methods. The result is that relatively few successful technologies are in use during any given period. In this sense, there is a kind of “ecological determinism” controlling technological diversity. At the same time, it is clear that even in places where industrial mining was practiced, the unique geology of local ore bodies contributed to the development of mining methods that were “appropriate”. As a result, the technology of mining is often more variable among mining sites than is expected from the standardized industrial technologies in wide spread use throughout any period.

Communities, Class and Gender

Nevertheless, mining archaeology inserts a distinct approach of industrial archaeology as a wide spectrum of historical archaeology and as archaeological studies in general.

However, according to Hardestey (1988), the key problem in the archaeological study of the mining community is relating the “settlement”, which is directly visible in the archaeological record, to “community”, which is a more abstract concept and which must be inferred by combining documentary and archaeological sources. “The terms settlement and community are frequently used interchangeably but it is useful to distinguish between community, ..., and the more archaeologically visible settlement, ...” (Lawrence, 1998:41).

The mining community represents the domestic spaces of people that were heterogeneous in character with a geographical mobility and a fluid, often temporary, market of the labor character. Beside technology and the workplace, industrial technology has the strongest impact upon the social organization of mining communities. According to Lawrence (1998), the community phases can be identified by changes in the physical settlement. During the rush phase of mining the hotels and shops, are the manifestation of immediate needs of individual and small scale enterprises, while in the latter phases the mining corporate needs are represented by public institutions and facilities such as schools, churches, meeting-halls and cemeteries.

In general, the technology of industrial mining is a centripetal social force, pulling together the mining community, creating a more highly developed sense of community and resulting in the loss of individual idiosyncrasy. According to Hardestey (1988), we can identify two different patterns of mining technology: a non-industrial pattern and a corporate industrial pattern. The non-industrial pattern can be characterized by the low-cost and low-energy mining technology with little variation in yield, wealth and political power, a decentralized system of power control, and miner-owner entrepreneurs, which constitute the “carnival-type” community. In contrast, the corporate industrial pattern includes the use of high-cost and high-energy mining technology, considerable variation in yield, wealth and political power, centralized power control, and wage labors, which constitute the “caucus-type” community. Therefore, a better knowledge of the relationship most likely comes from comparative studies of the correlation between technological and social variability on the mining frontier.

“The strategies of domination and resistance often evolve into cultures that have a distinctive material expression visible in the archaeological record” (Hardestey, 1998:88). Class, social status and class-consciousness strongly influence patterns of social interactions, where one lives, lifestyle, and the sense of belonging that underlies the concept of community, although divided in two spectral terms. The mine owners that control labor through mechanization attempted to make workers increase productivity through

specialization and repetition of tasks. In response, mineworkers formed unions and held strikes in resistance to this strategy.

The archaeological visibility of status and class in mining settlements are expressed primarily through archaeological and artifact assemblages, as well as differences among house sites. In this way, there are at least two implications of laissez faire individualist behavior in mining settlements. First, no one would expect higher variability among the artifact assemblages of house site of miners than those of comparable non-mining settlements. Secondly, the households of mining settlements are expected to be “inward looking” and atomistic, show little documentary or archaeological evidence of cooperative behavior. As class study in the mining archaeology, we recognize some characteristics of distribution and association of objects relating to the creation and projection of identities. Therefore these attributions may appear excessive subjective to the class in archaeology, and may be regarded as more specific than a ‘category’, and less particular than a ‘type’.

On the other hand, the conflicts between these two segments - owners and workers - are aspects visible in the mining archaeological sites. First, we have the hierarchical power structures with landscapes that reflect strategies of domination and resistance, or cultures of violence. Second, we have heterarchical power structures that reflect negotiations of individuals and groups in a ‘palimpsests’ of materiality formed by mobility and informal mining systems. However, 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 organizational principles of society.

In this case, a gender approach can also be applied, as according to Hardesty (1994) the presence of women in the mining camp can be divided into two movements, the working-class woman that typically arrived first adopts two gender-based strategies: the prostitute-entrepreneurship strategy that moves the woman out of the private spheres of the household and into the public marketplace, and the labor-union strategy that restricts the public sphere and increases independence and self-reliance of women. Another movement is the elite woman, characterized by the cults of true womanhood and domesticity, and the doctrine of separate spheres of economic and social activities. Churches and schools form the space of this elite woman, where the network is established between friends, church groups or civilian associations.

In this way, the remains reflecting these principles of gender may be found as the most common patterns of co-residential households in mining towns. Therefore, the gender discussion can also be conducted outside of the household. I understand the gender study in

mining archaeology as an approach that examines the social construction of gender and its representation in the archaeological record. In particular, attention is given to the activities, the relative positions of power and authority, and symbolic meanings that are attached to males and females in this particular society.

Mining Heritage and Research Strategy

“Mention should be made of the growing interest of historical archaeology in mining camps” (Douglas, 1998:98). Hardestey (1988) confirms that the management of historical mining districts begins with a total inventory of cultural resources in the planning units. Perhaps the best place to start is with a simple “location model” that incorporates documentary accounts of the unit’s history. The model gives preliminary information about what kind of sites are expected and where they are most likely to be located. Making inventories of mining sites requires a combination of oral, written and iconographic sources with archaeological surveys.

Some cultural resources are quite visible today but may not be mentioned in the written, oral or iconographic documents. These include mineshafts, prospects, roads, house sites, outhouses, and trash scatters. Most of these show up on aerial photographs or satellite images and can be readily identified. The archaeological evidence of each type of feature system, such as households or mines, can be treated as a separate sampling stratum and surveyed accordingly.

The second step in developing a field survey strategy, therefore, is the incorporation of these archaeological visible features. Between major activity loci is a “no man’s land” with no clear documentary or archaeological visibility to guide the pedestrian surveys. These areas should be treated as separate sampling strata and should be surveyed with “random” methods. Probably, the best approach is to divide the area into linear transects, to randomly select a percentage of these, and to do a complete survey of each transect selected. Mining features may cover a large geographical area, often well beyond the boundaries of a single site.

When evaluating the significance of mining sites, the representative criterion is best used within a comparative framework. In the framework proposed here, that implies evaluating mining sites at several different scales, from the feature system to the mining district and up to the world system. In addition, means building an adequate database of mining sites that can be used for comparative purposes. The scholarly/scientific information

or criterion, trivial questions are site-specific and singular to each case, including such things as the reconstruction of social practices, urban planning, and industrial technologies.

According to Hardesty (1988) the mining frontier has two distinct landscape characteristics. First, it is a network of islands; secondly, the network is marked by “boom-bust” cycles. Boom-bust cycles working at the “island” level of mining districts are usually tied to the geological vagaries of the ore body. The boom-bust cycles that work on networks, on the other hand, are the best viewed as correlated episodes or “punctuations” of the world system’s technological or economic changes.

For the purpose of this study, the feature systems of the mining technology, settlement spatial organization, and daily household activities are the documentary/archaeological expression of “behavioral variants”. The process of implementation, development and destruction of the mining sites, therefore, means the differential reproduction of particular kinds of feature systems. In this way, the archaeology of historical mining sites has much to contribute to understanding contemporaneous issues today, such as the ecology of human industrial exploitations and settlements, economic drastic alterations of the environment due to water and mercury used in mining processes, and complex political and social relationships inside mining societies and in their vicinities.

Conflict Archaeology Revisited

Historical conflict sites are unique in the composition of events that resulted in a singular, archaeological signature. The intentional deposits consolidated there reflect cultural practices that leave unique patterns of archaeological vestiges. In this way, a search for a correct approach to study intentional deposits of conflict sites aims to combine different strategies of scientific exploration to understand these singular signatures and unique pattern site characteristics.

Archaeology of violence is a strong statement about the archaeological remains of a conflict site. According to Carman (1997), archaeology is the long-term study of the human past through its material remains, and because of its deep time-dimension, this science is uniquely placed to comment on the human condition. In this way, archaeology can also study human violence, because it is a part of this same human condition. Looking for a broad understanding of archaeological patterns of violence and narrow patterns of group conflicts, I try to discuss problems involving group, conflicts and archaeology, methodological

approaches of battlefield archaeology, and forensic archaeology, until reaching the correct discussion of memory and historical places.

Nevertheless, the methodological approach will involve more details about the material culture, at times materialistically presented in the dispersion of cartridge and bullets in the old battlefields, or in broken bones displayed in grave sites. In setting the theoretical framework, I intend to apply a conception of collective action, and to accomplish this, I seek the social agent in the battlefield, to make this an element of construction and differentiation of groups in society.

Groups Conflict and Archeology

Saitta's (2007) work proposes to use an archaeological approach based on the collective action as a central rule, to understand the relationship among historical agents. With a pragmatic, philosophical orientation, the author presents the constructed and the contextual inferences of knowledge, and defines the archaeology of collective action as a theoretical and methodological strategy recurrent in studies of race, gender and class issues. The case study of the Ludlow Massacre provides excellent background to the application of social-based investigations of collective action, and supports a critical view about the public memory of the event.

The Ludlow Massacre was part of the Colorado Coalfield War of 1913-1914, a conflict between working miners and the entrepreneurs marked by bloodshed. In this case study, archaeology was used to recover forgotten voices of the massacre, voices differing from contemporaneous patterned visions that establish this science as a middle-class construction. "Archaeology has typically served middle-class interests" (Collective, 2001:95). However, the discussion of whether archaeology is or is not a middle-class activity, does not minimize its results. According to McGuire & Reckner (2003), the Coalfield War took place against families of miners, composed of isolated communities, that were uniformly made up of working-class groups, with a handful of managers and professionals. The executors of this conflict were Anglo-Americans of local, rural, agricultural communities that regarded the miners as inferior foreigners, and were mainly mining companies' private guards that were hired from the ranks of the rural working class, explicitly characterizing the class conflict dimension of this event.

Numerous institutions and researchers conducted the archaeological work in Ludlow, with the objective of clearly identifying the ordinary conditions of life and organization of

these workers. The archaeological search for common ground is a clear mark of historical preoccupation because if on one side, the pre-historical research is always searching for any possible information about the unknown, the archaeological research in historical periods is always searching for what we already know by means of other sources of information.

In this way, according to Saitta (2007), the official historians are nationalists, progressive, and triumphal, emphasizing social unity and continuity of the existing social order and its institutions. In contrast to this, we have a critical history that deals with context, transformation, and rupture, addressing both the historic process and narratives about some historical processes. Nevertheless, the work of an archeologist is about the vernacular history, which are local histories derived from the firsthand experiences of those people who were directly involved in history's events.

Saitta (2007) also discusses the concept of human agency, given that individual agency is a particular form of agency. Using Foucault's ideas, the author argues that the autonomous individuals exercising rational choice and free will are a relatively recent invention. In this way, agency must also include the operation of social collectives, and, like power, is less a thing we possess than a capacity that we exercise. The author explains that according to some agency theorists, the individual agent is the default form of subjectivity for all cultures across time and space, because the human acts always acts in company.

According to Saitta (2007), the working-class archaeology, the fruit of a Marxist Archaeology, is the study of workers' struggles with the industrial capitalists, over the conditions of labor appropriation, compensation and distributions of products. However, according to my understanding, Marxist archaeology is also the study of super-structural representation (law, religion, politics) and the group conflicts in the infra-structural level, between the relations of production and the productive forces, which are composed by labor and means of production. Each stage results in material signatures in space and time, which are archaeologically visible. The super-structural signatures are more symbolic and maintain ideological features, and are less apprehensive physically, without knowing the social cosmology of their owners. On the other hand, the infra-structural signatures are identified throughout the technological characteristics of structures and artifacts, which crystallized the groups' struggles between the relations of production and productive forces. "A common strategy stemming from the dominance and resistance approach has been to identify sites or assemblages associated with two different groups, say workers and managers, and then compare the material record" (Wurts & Fitts, 1999:03).

McGuire and Wurst (2002) discuss the relational concept of struggle that occurred in the past, our struggles to know the past, and use the past to struggle in the present; these three components can be referred to as knowledge, critique, and action. For the authors, the processualist ignored individuals and their conditions, while post-processual theorists would suggest that all individuals, as active agents, have equivalent power to act. This binary opposition simply deals with relations of inequality, and conceals their grounding in the social relations of power. In conclusion, the dichotomy that structures this debate is a nonproductive opposition that offers a false choice between individual agency and determinism, because these positions stem from oppositional thinking; the choices available are either society or the individual. As mentioned, they argue that the processualist and the post-processualist are dialectically related and assume that neither society nor the individual exist as essential nor autonomous "things," but rather that these terms summarize a complex web of social relations that bring those "things" into being. Summarizing the authors suggests that the analytical emphasis on social relations of struggle will resolve the dichotomy of current archaeological theory, because both approaches can mask real differences of interest in a group struggle, yet can reject any notion of totality or universals, which is not productive of real change.

Battlefield Archaeology

Battlefield archaeology presents many methodological tools that we might use to work with several cases concerning class conflict, such as those outlined above. According to Scott et al. (1989), battlefield archeology is "the exception that proves the rule". In the similar case of the Ludlow Massacre, not only were methodologies of battlefield archaeology extensively used, but also the exceptionality of this site was a marked characteristic to the archeological investigations. "The massacre sites itself represents a near perfect archaeological context. It is a short-term occupation that was destroyed by fire and subsequent use of the area has had little impact on the archaeological remains" (Collective, 2001:100). However, beyond the exceptionality of the site, the ethnical composition of the workers was also archaeologically traced.

On the other hand, besides the normal specificities, the methodology was also helped by the quantity and quality of historical information about the event. According to McGuire & Reckner (2003), photographs were used as a great aid and a rich source of information. The authors used a technique pioneered by Gene Prince and James Deetz to define the

position of the tents and other features in the colony. In this case, the authors made a transparency of the pre-massacre photo and mounted it on a camera lens, in a position by which they were able to look through the viewfinder and see the image of the camp superimposed over the existing landscape. Nevertheless, additional data was generated by the combination of archaeological research and historical documents.

According to Cornelison (2000), the potential of battlefield archaeology has been demonstrated since 1981, with Dean R. Snow's work in the Saratoga Battlefield. In Snow's work, he discards traditional archaeological techniques and chooses to use aerial photographs, magnetometers, and soil probes to locate battlefield positions. Another work that applied new techniques in battlefield archaeology fifteen years later, was Douglas Scott and Richard Fox's work, using metal detectors in Little Bighorn Battlefield. Cornelison insists that the work of Scott and Fox brought another differential to battlefield archaeology: the definition of battlefield patterns. In a similar fashion, Cornelison's case study in the Chickamauga presented several patterns, including group activities, such as the placing of caltrops, and individual activities such as the discarding of bullets and equipments. Consequently, the author argues that the study of battlefield patterns shows us the military order, or its absence, regarding the tactical conditions of individuals or groups, in a battlefield setting.

Scott and Fox's (1987) work on the Little Bighorn fight in the Custer and Reno-Benteen battlefields, between the Sioux and Cheyenne Plains Indians against the Seventh U.S. Cavalry, led by George Custer in Montana in 1876, is another reference to battlefield archaeology. Scott and Fox analyze numerous material categories, including armament, weapon types, campaign equipment and human remains, to trace a chronology of the fight and concerns about the behavioral dynamics, which intend to result in a theoretical-methodological framework to battlefield archaeology. Fox (2005) also underlined the singularity of this battlefield archaeology in his work about Little Bighorn. The author reveals in more detail the specific archaeological methodologies used to understand the occurrence. Using the revealed voluntary help of metal detectors and ballistic analyses of artifacts, Fox and his team described the conflict in contrast with historical documents about the fact.

Scott and Fox (1987) recognized four field actions towards the archaeological research: 1) the orientation phase, 2) the inventory phase, 3) the testing phase and 4) the inventory evaluation phase. The orientation phase was a facility to recording, mapping, describing, comparing, correlating, and developing computer applications of future

investigations. The inventory phase was divided into three operations: survey, recovery, and recording. In the survey stage, electronic metal detectors were used along with visual inspection to carry out the metal detector survey. The authors use various brands of metal detectors, and they argue that the standardization of machines was highly impractical. Nevertheless, the use of metal detectors in archaeology presents some restrictions and aversions.

Sterling and Slaughter (2000) reveal that despite the problems and biases, metal detectors have been used by archeologists since mid-1980s, primarily in battlefield sites where metal objects are the most numerous remnant. The authors conduct two sampling strategies in the Antietam Battlefield site to test the usefulness of metal detectors. The first involved excavating a percentage of 10-20 percent of narrow transects, and the second involved excavating all metal detector anomalies in the block areas. The result was that transects provided great distributional data, while the excavations provided limited, discrete data. The transects were aligned at eight-meter intervals, the topsoil was excavated and placed on a tarp, and the soil was expeditiously divided until the object was recovered.

However, in order to compare the systematic metal detector survey with the more traditional archaeological shovel test and surface inspection, the result was unquestionable. "The results were indisputable..." (Sterling & Slaughter, 2000:310). According to the authors, many factors can influence the effectiveness of metal detectors, such as the surface conditions (grass), soil conditions (compactness, moisture, mineral content), weather (windy or stormy), and depth, size, and orientation of the metal object.

However, Scott and Fox (1987) recognize some problems in the survey with metal detectors, because most of the detectors operate with the cone principle, by which electronic signals emanate from the coil and converge at the apex of the cone. In this way, the thickness of electronic coverage depends on the distance between coil and ground surface, the diameter of the coil, and the closeness of the sweeps. Secondly, the size of the object is also a factor in this equation because the detectors generally provided maximum depth readings of ten to fourteen inches. The solution was a distance of approximately five-meter intervals among the operators that walked in transect oriented, and was estimated that each operator covered between 1.5 to 2 meters. After a location was detected, a pin flag was placed and in some instance, the location was excavated immediately to provide a feedback of machine performance to the operator.

On the other hand, Sterling's (2000) work is a good example of ballistic analysis of battlefield artifacts. According to Sterling, bullets can be categorized as dropped or fired, and

in some cases it allows for a correlation with armies or a regiment from which they originated. When the similarities between bullets and guns are possible, meaningful evaluations of ordinance supply, military features, and battle signatures can be elicited through comparisons of archaeological data along with historical records. With this data, it is possible to understand troop movements and activities, and consequently the use of the landscape during the battle.

Nevertheless, Harbison's (2000) work presents the specificities of metal artifacts in battlefield sites. According to the author, the iron ordinance fragments were normally identifiable as thick pieces of heavily cored iron. In this way, the inside and outside curves are the unique forms used to determine whether the fragment was part of a spherical or conical shell, and consequently the type of armament that disparated the projectile. However, because of their heavily corroded state, the identification beyond these basic attributes is difficult, and in order to extract more information from the fragments, corrosion is removed from the iron ordinance, using electrolysis cleaning.

The methodology employed by Harbison includes several stages and defined steps. In conclusion, the author shows that the study of ballistics offers numerous results in understanding battlefield patterns; because the assemblage from each of the rest areas might shows a relationship between the artifacts and particular events that occurred there during the battle. More specifically, the archeologists might see the changes in the frequencies of various types of ordinance learning about the dynamic of the battle and could define who was firing into a particular area, as well as predict the intensity and strategy used.

Forensic Archaeology

Integrated with Battlefield Archaeology, Forensic Archaeology presents singular, methodological tools to work with human skeletons in the conflict context. "Most research has concentrated on the battle sites in order to understand the battle itself, and the burials afterwards have not been the main center of attention" (Mytum, 2004:44). The applicability of forensic anthropology in battlefield archeology is demonstrated by Scott and Snow's (1996) work on the analysis of human remains from the Little Bighorn battle and with the identification and reconstruction of a human skull, left humerus and right clavicle.

The osteometric measurements and observations on these bones revealed the age at death, the gender, preservation characteristics, and eventually the identification of these bones as belonging to a single individual. The teeth analysis, for instance, was consistent with

the historical data about the participants of the battle and the life of soldiers in the 19th century. Snow's (1996) comparison of historical data with the information gathered from the bones resulted in seven possible candidates for the identity of the remains. With facial reconstruction of the skull and photographic comparison, the number was eventually reduced to a single individual.

On the other hand, Wright, et al.'s (2005) work is a manual about the archaeology of mass graves. According to the authors, mass graves have numerous specificities, but the main indicator of a grave is the type of soil, as sometimes digging the grave brings poor soils to the surface (rich in salt and low in humus). Similarly, grave digging may penetrate a band of water, causing water to rise, bringing with it the organic products of the putrefying bodies, which in turn encourages the growth of herbs and grasses. The location of graves, in general, is the soft sediments such as river terraces and deposits of loess, presenting differences in color and texture.

Another specificity of mass graves is the stage of body decomposition. According to Wright, et al. (2005), it is not unusual for bodies within a single grave to show radically different states of preservation at different points within the grave. This is not necessarily an indication of different burial times, but rather suggestive of the fact that the bodies in the center of the mass grave are preserved better than those on the edge. Different degrees of preservation necessitate different treatment of the bodies; while the removal of skeletons is simple, fleshed bodies often pose a problem. On fleshed bodies, the periosteal tissues that hold the body together may have weakened, possibly because they have lost some of their live weight due to dehydration and putrefaction, which may lead to parts of the body breaking off if stressed by lifting, when removed from its place. In addition to the physical condition of the body, the mental aspect is equally important in battlefield archeology.

Outside the field and in the laboratory, however, the main question is: is it possible to identify violence patterns in the skeletons? According to Wakely (1997), the criteria for the identification of violent marks on bones, fall into two groups: location and appearance. The location of the damage is a strong indicator of whether there was a deliberate intent in inflicting the damage, such as injuries in the left fronto-parietal region of the skull that are possibly caused by a frontal "style" of fight, with a right handed opponent. Another indicator in skeletons is the depressed fractures in front left, suggesting combat, while if it occurred on the right or back, it would be suggestive of murder. Appearance is another strong indicator of causal injury. Two broad categories can be recognized: those made with a blunt instrument, producing a crushing blow, and those where the weapon has a sharp cutting edge.

Memory and Archaeology

In a broad sense, the most important question is: why remember class battlefields? “Historical archaeology is often viewed as a positive act, a means to remember that which has been forgotten” (Davidson & Gonzalez-Tennant, 2008:13). Streich (2002) reflects on the right of forgetting, and offers some explanations. According to this author, history is simultaneously interpreted and remembered, but the interpretations differ, depending on whether the viewpoint is that of the victim of historical injustices. However, for Flores (1998), the forgetting process is not a negotiable act, but a silence that is sustained by the social power or coercion, the same power that silences the memory and, in consequence, creates culture.

Streich (2002) sees the forgetting process as a stronger and permanent human option, perpetuated by individuals that through “free will” carry out memories of groups, which they choose to leave, in a one-time and non-reversible choice. Flores (1998) argues that the forgetfulness of memory is not a deliberate act, but a social strategy and constraint that attempts to preserve the forgotten, in selectively and strategic silences, so as not to rupture the order. In this way, the forgetting process is also a right for Streich, although an imperfect right, because survivors and descendants of historical injustices have the same right to argue and remember the past that they opted to forget. Flores concludes that forgetting is oppression, because “memory needs no validation since it thinks itself” (Flores, 1998:434); memory is autonomous and clearly marked by the winners and losers that constituted it.

According to Buchli and Lucas (2001), all memories are potentially intact in the stratified Freudian model of the mind, for Freud’s forgetting was therefore never really about loss, but merely distortion. However, another important element of historical archaeology studies that is present in this process of remembering and forgetting battlefields is the place. According to Flores (1998), memory-place is the conjunction of collective memories fixed to physical places that construct meaning. These memory-places are constructed by the interplay between memory and history, with memory attaching itself to “sites” and history to “events”. Flores argues that the semantic force of memory-place is explored in the collective memory that is semiotically grounded in geographic sites. This event provides physical and spatial locations upon which social meanings and concomitantly, social identities are fabricated. The author uses the Alamo battle in 1836 between Texans and Mexicans that was carried out for thirteen days, as an example.

Buchli and Lucas (2001) also argue that the relationship of material culture and the processes of remembering and forgetfulness are permeated by the concept of *copy* with remembrance as the reproduction of an original experience, and forgetting as its non-reproduction through the aberrant copy. Buchli and Lucas also argue that the explicit materialization or de-materialization of events can act to forge memories or facilitate forgetting, because they produce memories, not simply recall them. In this way, the space created between remembering and forgetting is materialized or dematerialized in a process of construction and destruction of monuments, objects and sites. According to Buchli and Lucas, the material process of remembering and forgetting is an image of the process of memorialisation and anathemisation. As a result, the empty space of knowledge is filled with goals and biases of “winners” embodiment; because, as revealed by Flores (1998), the collective representations, as social maps, shape the practices and views of those circumscribed by them. Therefore, these processes generate excess or residues in the wake of destruction, or deficits, gaps or “souvenirs” in the construction of monuments.

For instance, the Rosewood massacre of 1923 and the Tulsa Race Riot of 1921 are explicit residues of this type of action. “The first thing to say is that there is no Rosewood” (Newman, 1999:32). Rosewood was a massacre, where a black town was burned by a white mob in January of 1923, in Levy County, Florida. According to some scholars, the motive was an inequality present in the U.S. during the post-war period. “Events in Rosewood were symptomatic of racial patterns and tensions that existed throughout Florida, the South, and, to a lesser degree, the nation in the post World War I era” (Dye, 1996:621). On the other hand, the 1921 Tulsa war was America’s worst race riot, fomented by the irresponsible journalism and limited actions of the local police, and according to Halliburton (1972), “the total of causalities will never be known”; and such as Rosewood, the explanation is the same. “Economic competition between the races and charges of peonage were occurring at the very time of rising black expectations as a result of the conclusion of World War I” (Halliburton, 1972:354).

In these two cases, the major argument was an economic competition between races, but it is not the only possible explanation. According to Buchli and Lucas (2001), the archaeologists that work on the contemporary past need always to direct themselves to that which is forgotten. The archaeologists need to attempt literally and metaphorically to find what has been ‘buried’ and obscured, sorting through the hyperactive creation and dissipation of resources, information and material goods. This exercise between remembering and forgetting, such as in these two cases of Rosewood and Tulsa, show us that the “official”

explanations, and sometimes the “critical” review are not very accurate. The construction of a shared historical memory about these facts uncovered a violent “truth” that only archaeology can reveal.

Consequently, the material culture – that carries ideas and images, which our limited minds cannot contain – are our personal and collective memories. However, Buchli and Lucas (2001) appoint that the destruction or decay of these objects bring forgetfulness. Specifically in the case of battlefield archaeology of class conflict sites, the case is extreme, as the principal objective was the total destruction of the “other”, and the construction of a forgetfulness discourse.

Considerations about Conflicts and Archaeology

According to Carman (1997), violence is not a deliberate act, but an intentional process. Carman rejects a purely biological explanation for aggression, shifting instead towards the social and cultural dimensions of violent acts, because violence is an act directed by human beings against other human beings and with the intention of doing those others harm. In this way, violence is also a material event with material consequences, and it is archaeology because archaeology is a ‘materialist’ science. Consequently, these material results are traceable in the archaeological record and are accordingly available for archaeological study.

In this case, conflicts as registered in the massacres of workers in Ludlow or against African-Americans in Rosewood and Tulsa, are acts of violence; acts of violence that are legacies seen materially only in collections of objects, such as broken bones, burned ceramics and glass, or twisted metals, about forgetfully subaltern groups. On the other hand, the battle of Saratoga, Little Bighorn, Chickamauga, Antietam and the Alamo are studies that reveal unique patterns for archaeological researchers; patterns that are materialized with the displacement of cartridges and bullets, and other military equipment, which respond to questions about organization and human behavior in extreme situations.

The combination of these two types of sites, both group conflict sites, show us the unique signature of these spaces and the necessity of equal research about these events, mainly if these two cases are combined. In this way, the theoretical framework of groups and archaeology, the methodological approach of battlefield archaeology and forensic archaeology, and the ethical reflection about the right of memory and archaeology, are necessary to understand these archeological, unique signatures as collective actions.

CHAPTER 3

HISTORY OF A CONFLICT IN THE *PIRENEUS* MOUNTAINS

Unlike the previous century, Brazilian nineteenth century mining was always limited to a marginal category in the country's economy. Following the same technological tradition of colonial times, most mining exploitation in the interior of Brazil maintained old techniques to extract gold and diamonds of the ore deposits in riverbeds and hillsides (Galli, 2005). However, timely changes occurred with the arrival of external capital in the second quarter of the nineteenth century. These foreign enterprises during Imperial Brazil attempted to inject new trends in the old industry, but not without paying a social, economic, political, and sometimes environmental price. In sum, as explained by Eakin (1989) the foreign capital investments in mining companies during the Imperial Brazil were, with few exceptions, dismal failures. A foreign mining enterprise in *Lavras do Adade* was one of these failures, and here is its history.

Mining in Nineteenth Century Brazil

According to Calogeras (1938), the mining industry in the nineteenth century was marked by numerous problems. First is the colonial heritage of land ownership; because until the Constitution of 1891 the government had not separated possession of the ore layer from the surface soil. The 1891 resolution sought to minimize the amount of land that was exploited; however, it ended up aggravating the situation since many mining areas disappeared following legal disputes related to the soil and to the subsoil. An exception in the mining industry of this period is presented in the work of Eakin (1989) about the *São João D'el Rey* Mining Company, in *Minas Gerais*. Eakin explains in his work how a British enterprise survived for more than 100 years in this context, using technological adaptations and introducing a new industrial order into the agrarian surrounding community.

Secondly, Calogeras (1938) explored issues of infrastructure, communication, and roads. These issues often worsened given the isolated circumstances of the mining enterprise which primarily extended into the interior of the country. Moreover, the lack of national scientific studies about the mineral composition of Brazilian ore was the most problematic issue during this period, and consequently, most of mining technology was imported. Pertaining to the Brazilian native industrialization, Eakin (2002) argues that the most characteristic feature of Latin American and especially Brazilian industrialization was the

continuing absence of technological innovation and diffusion. According to this author, the technology transfer from more developed countries to Brazil and the rest of Latin America was delayed for several decades. As a consequence, a major failure in this process was not only the inability to duplicate the latest technological innovations, but also the prevention of new inventions and improvements from being generated.

Finally, the environmental impacts of gold exploitation were also presented in the Calogeras (1938) discourse with special attention given to the cleaning of the mining pollution. Dean's (1995) work is a good example; the author notes the environmental damages of mining in the Brazilian Atlantic Forest, such as mud in the rivers, large displacement of water to wash down hillsides, and forest replacement by mounds of gravel. However, Dean also highlights the necessity of investigation of other important source of pollution: the mercury.¹

Beginning in 1819 a specific method of gold mining exploitation in the Brazil was the "open cut" technique. According to Eschwege (1978), this first mining technique occurred with the establishment of *Passage Mine*, in *Mariana* town, *Minas Gerais*. The open cut technique was used for gold extraction in the mountainous hillsides in areas with ore deposits. The miners called these ore claims and the exploitation technique used *Lavras*. Eschwege explains that the earth of the hillside was perforated using iron bars, and channels were constructed followed the hill below, close to one another. In sequence, the water was brought to the highest point of the hill through a main channel, in order to generate enough force to drag the soil. The rich earth was then dragged by the water that comes from above, and the whole mass was deposited in a foothill channel made by a succession of little dams along steps. When this last channel was full, the content was stirred until the heavier ore had been deposited at the bottom and the barren soil released with successive dischargers.

However no other mining activity in the nineteenth century was as dangerous as the hydraulic dismount. The hydraulic dismount is a variant of the exploitation in the open cut mine technique presented by Eschwege before, and can be understood in detail by referring to the example of *Lavras do Abade*.² Besides the high costs due to the great energy consumption, these operations were also considered extremely polluting, thus demanding special care in their application. The oldest example of this hydraulic dismount technique in Brazil was also in the mine of *São João D'el Rey*, in *Minas Gerais*. According to CRVD

¹ "This source of pollution has not been investigated by historians and scientists" (Dean, 1995:98).

² For more details see "Mining Techniques and Gold Exploitation" sub-chapter in chapter six.

(1992) this type of exploitation became common in the end of the 1800's, probably because the entrance of some foreign mining companies that brought this technology to Brazil.³ However, even with some perceptions regarding the foreign auriferous exploitation in the end of 1800's,⁴ and the installation of *Companhia de Mineração Goyana* (Goyana Mining Company) or CMG in the *Pireneus* mountains.⁵ No other registers in the researched Brazilian mining historiography were conducted about the violent events that took place between the *Lavras do Abade* and *Meia Ponte* communities in the nineteenth century *Goiás*.

Goiás Nineteenth Century History

The *Goiás* history is also largely associated with the history of gold exploitation in the backwoods of Brazil. Gold exploitation in *Goiás* begins in the eighteenth century by inhabitants from *São Paulo*. According to Palacin (2001) the gold was responsible for the "advancement" of the colonization in *Goiás* probably one century before other colonizations in the interiors country. *Goiás* society in this period was formed by Portuguese's descendents (Ribeiro, 2001), indigenous people (Rocha, 1998) and African slaves (Karasch, 1996). Palacin (2001) explains that the society founded on the gold, and organized at the mines, was characterized by bad habits and violence.

In the beginning of the nineteenth century many aspects begin to change in *Goiás* province. Gold exploitation decrease in *Goiás* resulted in the partial ruin of other sectors too. The causes of decay, according to the miners, were the exhaustion of the mines and the elevated taxes. The effects were a decrease in imports and external commerce, a decline of internal commerce, a reduction of imported slaves, a lack of law and order, poverty and cultural isolation. In the beginning of the nineteenth century, in *Goiás* the mining economy of high commercial tenor had disappeared. It was replaced by a closed, agrarian, subsistence economy producing only enough surpluses for acquisition of essential goods. These changes also heightened the importance of determined families in the political and economic aspects of *Goiás* history; the importance of these families in the economic and political constitution

³ "Between 1870 and 1930 the gold-mining industry experienced its own 'industrial revolution' moving into an age dominated by corporate mining"(Eakin, 1989:117).

⁴"The years of 1880's is marked for the entrance of French capitals in the Brazilian mining" (author translation) (Doce, 1992:120).

⁵ "in *Meia Ponte*, in *Pireneus* Mountains, the shale contain quartz veins with pyrite and granular gold; there was a attempt of mining this *Lavra*" (author translation) (Calogeras, 1938:37).

of some regions was enormous; as in the constitution of the patronage system and the *coronealismo* mentality.⁶

Starting from the second half of the 1800s, the economic progress of the province was attributed, above all, to the expansion of agriculture and the growth of cattle breeding. This last activity was the cause of cattle breeding farms that, without legal authorization from the Crown, invaded the interiors and motivated the arrival of new migratory trends for the state. In this way, many social and economic factors distinguished nineteenth century Goiás from such littoral provinces as São Paulo, Rio de Janeiro, Bahia, and Pernambuco. These coastal provinces, in Goiás of the 1800's, had their economies based mainly in the monoculture exportation from coffee and sugar cane plantations from the southeast provinces, and a remaining sugar cane production from northeast provinces.

According to McCreery (1997), in the first half of the nineteenth century *Goiás* was an "archipelago" of isolated settlements sustained by residual mining and local agriculture. However, it was in the second half of the nineteenth century that cattle became the chief commercial product and the inter-provincial export of *Goiás*, because of its self-locomotion and little labor necessity. McCreery traces the development of an economy based chiefly on the extensive production of cattle, and argues that this economy was only viable because of widespread contraband and the evasion of inter-provincial taxes.

The extensive characters of the agricultural and cattle breeding system implanted during the second half of the nineteenth century in the *Goiás* province were constituted in the farm. The farms were also partly responsible for the formation of new social relationships, geographical occupation and image of the area. In this way, the personal relationships of suzerainty and vassalage during voting characterized the patronage politics of the time. In addition, two social images were formed between the departures and arrivals of the cowboys: the colonel and the aggregate. These economical practices brought to the surface the typical differences that characterize the interior of Brazil in relation to other coastal provinces, the "slowness" of the backlands, the subsistence agriculture and the extensive cattle-breeding farm.

⁶ According to Graham (1990) the patronage in nineteenth century Brazil was a theatre and it could be used as a way to grant protection, obtain official positions and other favors in exchange for political and personal loyalty; this system worked to especially benefit the interests of the well-to-do. In complement, Bieber (1999) alerts that it was through the *coronelismo* that the machine politics were linked to rural power and patronage system at the municipal level, as well as to province and federal politics.

For Estevam (2004), during the second half of the nineteenth century, the population increased and migratory changes were responsible for the re-accommodation of regional agriculture and cattle breeding in the single “cattle farm” - a basic unit of occupation in the province. In this way, the *Goiana* farm was different from other Brazilian farms in its socio-productive formation; because the subsistence agriculture was strongly linked to cattle breeding. *Goiás* nineteenth century history was also a singular stage of social and political transformations in many forms; passing from a mining society to a farm society in less than one century. However, the history of *Goiás* was perpetuated during the 1800’s with its own economic growth, initiated by the cattle breeding and agriculture cycles, which configured the province socio-economically according to McCreery (2006) in “archipelago” and later, “frontier” systems.

First the “archipelago” because 1800’s *Goiás* was initially formed by isolated settlements sustained by residual mining and local agriculture from 1700’s. Second, - a “frontier” - given that it was only in the second half of the nineteenth century that cattle became the chief commercial product and inter-provincial export. In the end of the nineteenth century a new economical and political framing was formed in *Goiás*,⁷ and its re-insertion in the country’s economy is achieved. However, it was in this same moment of social, economic and political reconfiguration that old habits emerged in the *Pireneus* mountains. And what could be interpreted as a revival of the gold period was marked by hostile and violent reaction from the surrounding villages of ex-miners and new ranchers.

History of *Meia Ponte* 1731-1880

The mine of *Nossa Senhora do Rosário de Meia Ponte*⁸ was founded in 1731 by Manoel Rodrigues Tomaz, while he was looking for gold in the margins of the *Almas* river. In the following years the mine became a camp, and was located along the left margin of the *Almas* river, on a soft hillside that faces the *Pireneus* mountains. According to Ferreira Costa (1979), the main labor in the mine was formed by natives that previously inhabited the area

⁷ "The opening of the seventh decade of the 1800’s establishes in the annals of the (*Goiás*) province a time of notable economic expansion, coinciding with the development of communication roads, and above all, the navigation of the rivers"(author translation) (Brasil, 1982:124).

⁸ “The name of the village come from the near “part-bridge” stream, in this place, Bartolomeu Bueno in his first campaign ordering a bridge construction in the margin where previous there existed a large flat stone, in consequence of this partial natural bridge the name of the camp was the same” (author translation) (D’Alincourt, 2006:63-64).

and African slaves, quickly becoming a place of lawlessness marked by authoritarianism, violence and tax evasion. Jayme & Jayme (2002) explain that through the rich tenor of the auriferous sands⁹ the number of people in the village increased rapidly with the arrival of Portuguese and *São Paulo* newcomers.

According to the voyagers (Leal, 1892; Pohl, 1976; Saint-Hilaire, 1975) in the beginning of the 1800's, the camp turned into a village, but in an irregular terrain that would not support the expansion of a traditional town. The urban center grew in the direction of the river and around the main church. The north part of the village was not organized uniformly with a street system, while the south was established with large and regular streets. This urban design remained unchanged until the construction of the *Bonfim* and *Carmo* churches, which attracted houses in their surroundings and consequently created the urban framework of today. The first decades of the nineteenth century were also productive in the village, with increases in commerce that were supported by troopers taking a route through the village while on their way to other provinces.

In 1819, Saint-Hilaire (1975) described that the village had the format of a square and was comprised of more than three hundred houses covered with roof tiles. Each one of them had a backyard with banana and orange trees, and coffee plants. In general, the streets were wide and in perfectly straight lines with sidewalks on both sides. In this village lived a Latin professor, with only 14 students. They also had a Franciscan hospital to serve the population suffering from elephantiasis and leprosy. One year before, Pohl's (1976) attention was on the houses that were constructed of wood and clay but did not have glass windows. The glass windows in the majority of houses were substituted with linen fabric; glass windows were only found in one of five churches that decorated the village. Ferreira Costa (1979) also explains that the *Meia Ponte* society of the 1820s was marked by endogamy among the elite, with expanded incidents of illegitimate marriage among the subaltern classes.

In 1823 D'Alincourt (2006) described the village as large with an average sized population¹⁰ and the only village, besides the capital *Vila Boa*, with emerging commerce.

⁹ (In 1886) "The province was maybe the richest of the Brazil Empire in the mineral kingdom, because of its crystals of vary colors, great amount of calcareous stone, minerals of iron, and principally the gold that is plentiful in slopes and creeks, as like as, diamonds and other precious stones" (author translation) (A. J. C. Brandão, 1978:25).

¹⁰ In 1816 there were 124 white married men and 462 singles; 144 married mixed race and 734 single; 57 black married men and 248 single; 120 white married women and 562 single; 200 married mixed race women and 796 single; 40 black married women and 364 single; 1.356 male slaves and 926 female slaves; comprised a total of 6,133 souls (author translation) (D'Alincourt, 2006:65).

During the same year, Cunha Mattos (1979) observes that the village has artificial illumination, and only 194 soldiers in three cavalry and four infantry companies. Between the years of 1830 and 1834, the city became the headquarters of the first newspaper in the province of *Goiás*, the *Matutina Meia Pontense*, as well as the location for a music band. Recreational activities of the *meiapontense* society were long baths in the *Almas* river, as well as, the celebration of religious festivities such as *Festa do Divino* and *Cavallhadas*. According to Ferreira Costa (1979), the *Meia Ponte* village was the second urban nucleus of the *Goiás* province during Colonial and Imperial periods; competing actively with the capital *Vila Boa* in economical and cultural expressions.

Around the 1850's, parallel with the end of the mining in the *Almas* river, the *Meia Ponte* society was organized in new economies based on agriculture, cotton exploitation, livestock and trade. This new phase of the village provided the forum for agricultural oligarchies that were controlled by extensive families and a patriarchal political system. Following D'Alincourt (2006), the cotton exports of the village were so valuable in the province that some farmers like Joaquim Alves de Oliveira prohibited the slaves from participating in mining activities, and gave them "incentives" to plant cotton on their days of rest. The patronage and slave system in *Meia Ponte* was hence strong that the same farmer in the following decades established his slaves as police officers. His plantation was so autonomous that all supplies were produced internally and the only imported products were salt, iron, and more slaves.

According to Semerene Costa (1995), the economic change during the nineteenth century had many impacts on the *Meia Ponte* society. The common types of agriculture were executed by many residents while the big farmers concentrated on monoculture and then eventually on cattle breeding. Most entrepreneurs focused on trade.

Commerce, however, was restricted to the provincial and internal village market; the village had little exportable products to offer to coastal consumers from other provinces. At the turn of the nineteenth century, the fragile commerce accumulated a monetary debit among the residents while also improving the suzerain and vassalage system in the village (they charged political favors with economic dependence). At the end of the nineteenth century, the old mining community, and now farming village finally grew into a municipal district referred to as *Pirenópolis*.

Since the eighteenth century *Goiás*, villages had appeared and disappeared at the mercy of gold-bearing ore deposits. Many of those nuclei regressed with the decadence of the *Lavras* while others survived and adapted to the new conditions in the nineteenth century.

Meia Ponte was one of those villages, because in less than one century it experienced the splendor and decadence of gold, and sometimes also with different products.¹¹ However, a gold exploitation re-occurred at the end of the nineteenth century in the *Lavras do Abade*, and what could have been a revival of ostentatious times in the *Meia Ponte* village was marked only by disagreements and conflicts.

History of *Lavras do Abade* 1880-1887

According to local narratives, the exploitation of gold in the *Lavras do Abade* began around 1750, when the military official João Rodrigues Abbade discovered a gold-bearing ore deposit in the southwest of *Pireneus* mountains, inside of *Cabaçeiros* farm, between the villages of *Meia Ponte* and *Corumbá de Goiás*. The oldest written information about the area is during Saint-Hilaire's (1975) short visit to the *Pireneus* mountains in 1819, when he found vestiges of a house in the area, and which according to his informants belonged to one old miner who had employed slaves for gold extraction. Along the top of the mountain, the voyager also observed gold- mining debris in the nearby streams. Finally, at night Saint-Hilaire stayed in a shelter of an old ex-slave who lived in a cabin in the area, and who probably was one of the miners or a miner's descendant.

According to Tavares¹² (1883) the mineral formation of the *Lavras do Abade* ore deposit is very similar to the *Ouro Preto* in *Minas Gerais* area. The gold is in the shale matrix rock and it is formed by small concentrations of the crystal quartz, along with pyrite, oxide of manganese, iron and titanium. The medium depth is about two to six meters and the soil is so loose that it can be worked with hydraulic jets. The expected production is 1/8 gold (3,586g) for each 23 Kg of cubic soil meter; an amount that generates a considerable profit.¹³

The *Lavras do Abade* remained without an owner until the 1880s when the gold exploitation was reactivated through the *Prado* Company commanded by the French manager

¹¹ Discovered since the time of mining; the principal mineralogical riches besides gold was the *Pirenópolis* Stone, an elastic quartzite in foil form composed of granular quartz in association with talc. The foil size ranges from 70 to 200 cm. in length and 2.5 to 6 cm. in thickness. The more elastic and refractory foils are used as wood stove tamp, the fragmented pieces are used to cover walls and sidewalk, and the solid blocks sharpen stone (Pohl, 1976:117).

¹² According to his nephew, Crispiniano Tavares was the first Brazilian to graduate in geological studies in Goiás; he was trained by the prestigious *Minas* Mining School of *Ouro Preto* in 1881 (Jr., 1972:CLXXIII).

¹³ "The median production in the area is about 1/8 ton of earth" (author translation) (Tavares, 1883:CLXVIII).

Bernard Alfred Amblard D'Arêna (or in Brazilian Portuguese, Alfredo Arena). The freemason and writer Alfredo Arena¹⁴ was a native of Toulon and had lived in Brazil since 1851.¹⁵ He was trained in Dentistry with knowledge of Law, Engineering, Mechanics and Medicine. According to Curado (in: Jayme 1971), he was of medium stature, with blue eyes, a square mustache, and balding. He was known for being a great speaker, fluent in more than one language and well-mannered; always dressed in white, with a Chilean hat, a jacket with four pockets, culottes, high boots and a cartridge holder around his belt with two revolvers (Figure 3-1). The *Prado* Company also explored gold in the mining village of *Bagagem* in Minas Gerais, and in 1882, together with *Arena Society & CIA*, they formed the *Companhia de Mineração Goyana* (CMG).¹⁶ According to Semerene Costa (1995), the CMG Company had more than 300 small investors compounded from *carioca* businessman to *goiano* farmers, with the president Antonio da Costa Chaves Faria.

Significant modifications in the area began to happen with the installation of the mine, such as the adjustments of the *Almas* river and *Barriguda* stream through ditches of stones which resulted in more than one kilometer of length (Figure 3-2). The re-directed water was accumulated in dams with fluctuations controlled by gates (Figure 3-3). One gate was connected through stone ditches with the mine's eastern extremity, to clean the detritus rocks of open cut mining exploitation in the base, while another was directed to the aqueduct in a wooden structure more than 70 meters high and 370 meters long (Figure 3-4). This flume passed by a waterwheel that provided energy to the crunchers and saws and it ended in a 20 meter cascade that fed the hydraulic machine¹⁷ with approximately five gravities of atmospheric pressure (Figure 3-5).

Besides the installation of the equipment, a town was built for the employees with approximately thirty houses in stone walls and straw roofs (four covered with roof tiles), and wide streets (Figure 3-6). The village also included a trade store, a drugstore, the dining hall

¹⁴ "On his travels, he created Freemasonry stores and literary clubs in some towns, earning a prestigious name" (author translation) (Leal, 1892:116).

¹⁵ Arquivo Nacional, Rio de Janeiro [hereafter AN] – Boullier – Serie Agricultura – Produção Mineral – Letter to Agriculture Ministry by Alfredo Arena – 8R –IA5 – N. 06 - CODES – 28 December 1889.

¹⁶ "This company was organized in the court with five hundred *contos de reis*, and with the efforts employed by its manager; this company is expected to extract great results" (author translation) (A. J. C. Brandão, 1978:45).

¹⁷ Probably a Little Giant with Hopkins system, invented in California around 1850's. To more details see "Mining Techniques and Gold Exploitation" sub-chapter in the chapter six.

and kitchen, butcher shop, the slaughterhouse, soap factory and sawmill (Figures 3-7 to 3-11). Inside the sawmill that was next to the carpentry office was the maintenance facility for the hydraulic system and the mill activities of the village. The soap factory also produced candles. The store sold medicines, cosmetic items, plates, cups, fabrics, hats, coats and umbrellas. The village was dispersed along the small plateau in front of the mine, enclosed within stone walls and two gates – one closing the road to *Meia Ponte* and other to *Corumbá de Goiás*. Outside of the walls were the cattle corral, coffee plantation and in the border of the *Lavra* – at a distance of approximately two kilometers, the roof tile factory and clay deposit.

Arena's home was located in the center of everything and it contained the foundry and arsenal (Figure 3-12). Alfredo Arena channeled the water and built his house with glass windows, and wooden stairs in front of the door. In the internal patio, he had several fruit trees and areas covered with pavement stones. He furnished the house with furniture pieces of fine value that arrived directly from Europe along with curtains and rich rugs. In the weapon room, rifles were hung up and clavinets, revolvers, and swords were decorated with red velvet and hunting horns. The dining room contained an enormous table with a marble top. His house was similar to the European style of homes, and parties and dances took place at his home on many occasions.

On the hill opposite Arena's house, an artillery piece was installed, and two mortars were mounted in his patio. In the mine apex, Arena coined his own money in gold and copper with engravings of *Valida-Arena*. At that time, the village was known as the largest auriferous mine with hydraulic dismounts in Imperial Brazil.¹⁸ The number of employees was unclear, according to Freitas (1996), there were 22 men and 12 women in 1887, and the majority of the 38 workers were temporary employees. While the greater portions of the workers were from the towns of *Meia Ponte* and *Corumbá*, there were many workers from others villages surrounding and including other provinces (Figure 3-13).

However, starting in 1884, problems with water pollution and legal disputes soured the relationship between the *Lavras do Abade* and *Meia Ponte* village. The mine was accused of becoming unacceptable because of its pollution to the water of the *Barriguda* stream, which

¹⁸ According to Calogeras (1938:471), the information about gold production during the period of 1860 to 1896 is not exact. Therefore, until 1884 it's possible that according to the *Minas* school of mining reports that the gold extraction in Brazil was around 50,000 Kg. The period between 1884 and 1896 down to 24,000 Kg, based in the *Passagem* (and probably *Abade*) extraction, until the *Morro Velho* disaster and *Pari* mine ended in 1886. In the year of 1896 the production was only 910,283 Kg of gold.

is tributary of the *Almas* river that cuts through the town. According to Carvalho (2001), the work in the mine continued despite these protests, and the waters of the river were consequently always dirty. The residents made several agreements to try and solve the problem, but these water resources continued to become depleted. Arena was notified by the public authority with a petition supported by 169 signatures; it threatened him with the possible destruction of the place and expulsion of the workers. In response to this provincial resolution of March 1st, 1886, Arena obtained an Imperial resolution from the Agriculture Office on February 25, 1887 to proceed with mining activities.

Mining exploitation continued at maximum capacity until March 22, 1887 when a group of approximately 27 assailants, strongly armed and masked, coming from *Meia Ponte* village, invaded and set fire to the town, driving out the miners with shouts and shots. According to historical documents from the CMG Company, there was a claim presented to the Imperial Government,¹⁹ about the assault occurred between the 22nd and 24th of March, 1887 while Alfredo Arena traveled to *Rio de Janeiro*.

The attack was planned by Major João Gonzaga Jayme de Sá from *Meia Ponte* town, and was led by his 17 year old son, Sizenando Gonzaga Jayme de Sá, with support from his brother, Judge Luiz Gonzaga Jayme de Sá and his other brother, Sheriff João Gonzaga Jayme de Sá Junior. Other participants include their other two younger brothers, Félix Gonzaga Jayme de Sá and Frederico Gonzaga Jayme de Sá. Therefore, not only did the Jayme de Sá family execute the plan, but they also recruited friends, such as Aristides de Holanda Siqueira and Urusino de Holanda da Siqueira, Theodoro José do Carmo and Hilário José do Carmo, and Deolindo da Silva Baptista, as well as, Lieutenant Rubens Pereira da Silva of the nearby town of *Corumbá de Goiás*.

Alongside this group of assailants that was formed by local authorities, there were members of important families of *Meia Ponte*, with their faces painted black with sugar-spirit and gunpowder; and also others such residents, slaves and soldiers were convoked to participate in the attack. Sent by their masters, the slaves made up the majority of the party who participated directly in the assault. The slaves included Paulo, Chichiu, and Benedicto Vieira from Antonio Gomes do Engenho; Romão and João from the planter Manuel Barbosa

¹⁹AN – Boullier – Serie Agricultura – Produção Mineral – Companhia de Mineração Goyana: Reclamação para Indemnização – 8R –IA5 – N. 08 - CODES – 1887. This is a case file that was mounted by the CMG Company claiming indemnification to the Imperial Government. The case file is composed by almost 300 pages of corporate documents, personal letters, official documents, newspaper clippings, pictures, and employee testimonials about the conflict. These case file provides all the historical data to the sequent narrative presented by the author about the attacks.

José da Siqueira; Humbelino from the planter Joaquim da Costa Carvalho; and Nécio from the priest Neco Sacristão.

The soldiers José Estamislão da Silva, Elias Forquato de Souza, and Duarte da Silva followed orders from Major João Gonzaga Jayme de Sá, while the jailer Alexandre de Sá offered payments of up to 20,000 Réis to others soldiers and inhabitants of *Meia Ponte* village such as Chico Ferraz and his friends. Many young men also joined the crew along with the Jayme de Sá family, such as Benedicto (son of Luiza), Artur Altino de Sá (son of Joaquim); Jacinto and Laurindo (sons of Luiz da Costa), Chiquinho (son of Socrates); and Adolpho (son of Theodoro Baptista).

Preparatives to the Assault

The preparation for the conflict between the two villages started on March 21, 1887, with verbal threats by the *Meia Ponte* residents made to the *Lavras do Abade* workers, similar to the cases that occurred with the employee of CMG Company Affonso Leonardo Milliet from *Rio de Janeiro* and the slave-washerwoman Perpétua Avelino.

Affonso Milliet was responsible for supplying the *Abade* village with products that were not produced in the *Cabaçeiros* Farm or inside of the *Lavras*. While in *Meia Ponte*, Milliet was warned by the planter Manuel Barbosa José da Siqueira, that the Imperial license to proceed with the mining in *Lavras do Abade* was granted. The planter declared that the mine would not have one more day of production, because he and his fellow co-workers would destroy everything on the next day. After arriving in the village, it was possible that Milliet had communicated what had happened to the other miners, but this is unlikely since that there was no organized type of defense prior to the assault.

Perpétua Avelino also received warning; she was a slave of Maria Benedicta from *Meia Ponte* and worked in the *Lavras do Abade* as seasonal washerwoman. One day before the attack, when she arrived at the house of her owner in *Fuzil* Street, she was approached by Francisco D'Assunção (nicknamed Chico do Morro). He requested her keys to the gate and information about the place where the miners would be working in the next day. It was possible that she did not hand him the keys because in the attack the damage realized by the assailants at the gate that had access from *Abade* to *Meia Ponte* was notable. She also was threatened by other *Meia Ponte* residents in the *Vendinha* village, a nearby commercial post between the *Abade* and *Corumbá* villages. She was warned with the phrase: The spell got

played. Which obviously was a bullying tactic about the pending attack in the village, and it was probable that other miners received the same treatment in the days before.²⁰

The First Day of Attack

The conflict effectively started on March 22, 1887, at around 6:30 in the morning; when twenty or more people arrived at the *Lavras do Abade* village. The group was divided into two divisions: the Judge and Sheriff stayed at the gate with part of the group while the minor Sizenando Jayme commanded the others to start the attack. With axe blows, they opened the gate of *Meia Ponte* that provided entrance into the village, and destroyed approximately 21 *Braças* (21 feet) of the stone wall with metal levers.

The main target was the manager's house and the objective was to steal and destroy more than 40 firearms that were a part of an arsenal of 23 rifles (18 smashed and five stolen), 20 clavinets (three smashed and 17 stolen) and one stolen *Lefauchaux*²¹ double-barreled revolver (Figure 3-14). With axes in hand, the group invaded the house through two doors, one located in the front and the other in the back. They started to destroy three glass windows, one located in the front room and the others in the kitchen. Besides, they destroyed the internal doors leading from the corridor to the kitchen, the deposit room and the secretary half-door. (Figure 3-15 and 3-16).

In addition, the manager house was not empty. Alongside the journey of Alfredo Arena to *Rio de Janeiro*, there were other residents inside the house including five women and one man. The miner Benedicto Braga, who was in the house, decided to resist and hit the assailant Antonio Feliciano. In response, Antonio Feliciano stabbed Benedicto Braga in the arm, but did not finish the fight because he was disarmed by other gang members. At the same time the five women, Dona Umbelina the companion of Alfredo Arena, the employees, Rosa Ferreira, Maria Ferreira and her daughter Benedicta Ferreira, and the domestic slave, Mereneia, who were hidden in the room of the house, started to escape.

²⁰ However, some contend that the miners' preoccupation with the possible actions of revenge by the *Meia Ponte* residents was a constant condition. Another fact that could represent a stage of "alert" of an imminent attack for the miners the next day lay with the statement of the miner, Jacinto Dias do Santos. The miner said that he was sleeping in the dining room of the manager house on March 22, 1887 until two in the morning and he decided to go the store to talk (or wait for the attack?) with the salesman João Nicolau until five in the morning.

²¹ French *Lefauchaux* was the first revolver with metal capsule and side percussion used in the country, adopted by the Brazilian army and navy in 1858, and was used until 1873 when it was replaced by the *Gerard* model (Castro, 2009).

When Rosa Ferreira was in an alcove folding cloths from a box, she started to hear yells from the invasion, and ran to the back door of the house once she saw the slave, João (of the planter Manoel Barbosa) and the blacksmith Joaquim Pires da Penha inside of the house. The dog guarding the house called *Belleza* (Beauty) started to bark, but was silenced with a shot or a stab. Maria Ferreira ran almost three miles along the stone aqueduct that passed in back of the house to the nearest village, called *Vendinha*, with her daughter and her son, Antonio Ferreira who had come to help. At the same moment, Bárbara Candida de Jesus, the slave-washerwoman, exited the canteen to the store and noticed the arrival of the assailants. Bárbara yelled a warning to the slave-master and shoemaker João Carneiro da Matta for them to get their gun. The cook, Luizatina da Silva, was in the store talking with the carpenter wife's, Bernadina Nunes de Souza. Along with the salesman Felicissimo do Espírito Santo, they all hid and observed everything together.

D. Umbelina, the person that had escaped by the alcove window, decided to return to the house, against the recommendation of João Carneiro and the miner Ignácio Fontes Leal. In the front yard of the manager's house, D. Umbelina was captured by the slaves João and Evaristo, who started to beat her; in consequence she suffered a panic attack. The torture was interrupted when Eufrásio, an ex-slave of Major Jayme de Sá, ex-miner in the *Lavras do Abade* and member of the assailant group stopped João with a punch in the face. At the same time Bárbara and Luizatina, slaves of D. Umbelina, came to rescue her while João Carneiro also ran towards them. However, João Carneiro was knocked out with a machete blow in the head. Mocking D. Umbelina, Chico do Morro screamed: Black woman cannot have a panic attack; a panic attack in black is a luxury! Rosa Ferreira also escaped with the house slave, Mereneia, and she queried the assailant Eufrásio: Why do you come here? And he answered: I came here by order of my master Jayme or I will be punished, but you did not see me here or I will need to kill you.

Inside the house, Sizenando Jayme yelled: It is necessary to only steal the firearms! It's good to right what is wrong! I have sorrow about staying here, but I am a son of the law and need to do what she orders. Elysão Telles started to destroy the sewing machines. In the dining room, the damages were numerous; the coat hooks were taken off the wall, and the big dinner table with its felt cover was destroyed, along with the chairs, lamps, and portraits. In the alcove, the drug supplies for the dentist's office were broken, the metal enamel bowls and jars were crushed, and the camp bed and mattress were removed. In the kitchen, the ceramics and glass artifacts were damaged, the table and water pots were smashed; the wine flagons, olive oil bottles, and the sugar spirit barrel were broken. In the administration room, the

marble and iron scales were shattered, as well as the bottles with iron sulfate, wood boxes, cartridges, a plaster can, and a wood support for a photographic machine.

While the first group attacked Arena's house, the trooper Manoel João José de Souza Bitencurt had woken up sick and went to get his mule in the *Gameleira* alley. However, he was stopped outside by the Judge or the Sheriff who had killed a dog that followed the trooper as a "warning". The second group arrived at the house of the employee Affonso Milliet, to ask him about the place known to be the heavy tools storage, so that they could confiscate the tools to demolish the aqueduct. In the heavy tools storage, they opened the door with blows from a hammer aimed at the lock. With axes and heavy hammers, the second group destroyed parts of the wooden infrastructure that was supporting the aqueduct, and took off segments of tube that were a part of the hydraulic structure (Figure 3-18).

The *Meia Ponte* storekeeper Theodoro Jayme de Sá invaded the store by knocking down the door with a hammer. He searched for matches to start a fire in a mound of wood planks that were deposited in front of sawmill. Inside of the store, Joaquim Pires broke the glass windows with a gun handle, while the slave João and two more assailants started to steal products and money, such as: olive oil bottles, glasses, hat rabbit fur, denim jackets, American fabric, and horse equipment. They also broken medicinal, nutritional and perfumery flasks, such as: milk of magnesia, *Tártaro Emético*, *Ricino* Oil, *Puaio* and creams, as well as, white and black bottles, plates and cups. The damage in the store included stolen products, and the doors that were also damaged from blows of the hammer.

The fire spread to approximately 1,500 wood planks (including *Jatobá* wood); the flames quickly reached the sawmill but when the assailants left the mining village, the fire was put out by the master carpenter, Damião da Costa Teixeira and another carpenter, Joaquim Félix. Therefore, the damage to the sawmill was extensive, especially to the equipment inside boxes of carpentry tools, pulleys and belts to transport wood, the circle saw system, as well as, the metal wires and cut nails, train tracks, sieves and instruments to retrieve gold, bull cart wheels and chassis, and many parts of the mill system. During their exit, Theodoro de Sá, Josino da Costa Teixeira, Laurindo (son of Luiz da Costa) and José de São João stole one can of dynamite and one box of fuse from the gunpowder house. At the end of the attack, the assailants left shouting and shooting guns, and around ten in the morning they arrived at the *Bomfim* church of *Meia Ponte*.

Some miners did not witness the attack, such as Manoel Nicácio da Cunha, Elias Alves, André Rodrigues Borges and José de Souza, since they were in the forest collecting wood. They did not return during the assault because they assumed that the shouts and shots were in

reason of Arena's returns to the mine from *Rio de Janeiro*. While others such as Florentino Souza Pereira, Diolinda Avelino, Idalina Anna Paulista, Maria do Campo, Maria Cigana, Theodoro da Cunha and the *sergipano* Manuel do Nascimento escaped to the forest and observed from a distance the destruction of the *Lavras do Abade* village.

The Second Day of Attack

On the morning of March 23, 1887, some men returned to the *Pireneus* mountains to destroy the dam. To reach the dam area, they destroyed the *Corumbá* gate with blows from an axe. In the *Almas* river dam, they cut two wooden pillars supporting the earth wall and demolished the foundations. The entry and exit metal water-gates were damaged with levers and one portion of the stone aqueduct was demolished. On the other side, Florentino Borges and Rodrigues Borges brought an oxcart to steal three boxes of gunpowder, and after the robbery, they soaked approximately one arroba and eight libras of the remaining gunpowder in the gunpowder house.

That morning, the blacksmith Manoel Francisco da Silva tried to call the interim manager of CMG Company Antonio Viegas de Athayde who lived in the capital *Vila Boa*, but he was blocked by the flood of the *Corumbá* river. When he returned to the village, he decided to depart from the mine to the next *Prata* farm of Joaquim Caetano Telles. Following him, D. Umbelina, the slave Bárbara Cândida, the trooper Manoel João and Maria Antonia went to the *Prata* farm, while the cook, Luizatina da Silva left the mine with the others to the *Vendinha* village.

On the afternoon of March 23 in the *Meia Ponte* village, Theodoro de Sá that had stole three dynamite sticks from the mining village: one as a souvenir, another to sell in his store, and the third to be used; executes his plan. The target of Theodoro was the house of his neighbor Baptista da Ponte, which was located on *Bomfim* Street. This "collateral damage" was because Baptista da Ponte had refused to participate in the assault. The same type of punishment was inflicted upon others *Meia Ponte* residents who refused to follow the group, and because of this, their glass windows were destroyed by gunfire. In consequence of this violence, the *Meia Ponte* resident Joaquim José and others moved to the village of *Corumbá de Goiás*.

The Third Day of Attack

On the morning of March 24, 1887, the assailants appeared again in the *Lavras do Abade* village, now with a parade across the miner's houses street. They set fire to the rest of the sawmill and stole the baggage and equipment of the remaining miners. The attack was started with approximately 35 to 40 men who waited outside the village, and commanded by Lieutenant Rubens, while a small group entered the mine with the minor Sizenando Jayme de Sá.

The remains of the sawmill was burnt again, with the major loss in the central part of the building with an extension of approximately 60 *palmas* (30 feet) and of 20 *palmas* (10 feet) in the mill building. The loss of the buildings was total (Figures 3-19 and 3-20). The wooden aqueduct was also damaged, with six supporting pillars cut off with axe and hammer blows in the sawmill section, 15 meters taken off and two supporting pillars cut off in the second section, and four meters taken off in the third section. The first water box was also dismantled, while the second support pillar had been cut down.

The resistance of the miners by this time was nonexistent; in the last minutes of the attack all of the remaining employees were neutralized. George Frappy, André Borges and Manoel Ferreira da Silva were disarmed by force and with yells by Eufrásio and several assailants. While leaving the house, the miner José de Souza Bitencurt was approached by Victório Chaves de Andrade. He said: Run, they are destroying everything. They control the doors and windows, and they took the guns of João Carneiro, Manoel Ferreira and André Borges. Inside the house of the salesman Felicissimo, the miner Francisco Alves Louzada and his pregnant wife, listened to the shouts of: Kill? Not kill! What is it, people? When Francisco and his wife opened the door to escape, he was surprised by Chico do Morro who while invading the house assured them that he would not abuse his wife. On the other side, José Bitencurt hid in a grotto in the hill, and afterwards escaped to the *Vendinha* village. Victório escaped to the other side and followed the remains of the aqueduct to the top of the hill where he later encountered José de Souza, Francisco Alves Louzada, Jacinto, and Benedicto Braga.

On the other side of the village, the wife of the carpenter Bernadina received a slap in the face from Joaquim José do Nascimento (nicknamed *do Vigário*), because she implored him to not burn down the manager's house. At the same time, the carpenter Damião ran into his wife Bernardina, but he was surrounded by assailants pointing guns. While beating the

side of a machete to his head, Sizenando said: Get out of here or die! The blows were only stopped by Eufrásio, his old friend.

The carpenter Damião asked Chico do Morro: What madness is that? Why did you come here to steal and rob? Silence was the answer and the destruction of the village took place, this time, with more savagery and without any restrictions. The last assault was organized two days later when the Judge, Sheriff and Lieutenant gathered with five men to prevent any “possible” reaction. They supported a mob invasion of the village around the residents of *Meia Ponte* and *Corumbá de Goiás* villages. By this time nothing of value was left, and the destiny of the *Lavras do Abade* village was temporarily sealed.

Results of the Conflict

Following these events, many newspapers publicized stories and a series of judicial battles²² resulted in the pardoning of all participants,²³ mainly due to their young ages.²⁴ Arena was in *Rio de Janeiro* during the event and he never returned to the *Lavras do Abade*, switching instead to the exploitation of diamonds in *Minas Gerais* where he came to die during the twentieth century. According to Antonio Viegas de Athayde,²⁵ the loss was around 200,000 *Contos de Réis* in property and destroyed products, and the production loss of one *Conto de Réis* every day.²⁶

Over the course of three years, numerous lawsuits were initiated by Alfredo Arena against the Imperial Government soliciting federal compensation for the destruction of the mine. In the majority of the petitions, the argument was that the destruction of the village

²² The only concrete action was the official exoneration of the judge and the sheriff. AN – Boullier – Serie Agricultura – Produção Mineral – Nota do Ministério da Justiça – 8R –IA5 – N. 08 - CODES – 24 July 1887.

²³ “One more time, it was been judge many angry citizens accused as perpetrators of the robbery, destruction and arson of the *Lavras do Abade* in March 24 of 1887; I was invited to defend seven accused and accepting, I obtain the unanimous acquittal!”(author translation) (Leal, 1892:146).

²⁴ In a thanks letter, dated of 18 July, 1890 and signed by the youths: Benedicto Antonio de Abbadia, Benedicto Gomes da Silva, Paulo Gomes da Silva, Umbelino da Costa Carvalho, Theodoro Jose de Sá, Francisco do Morro, and Joaquim Pires da Penha (Leal, 1892:147).

²⁵ AN – Boullier – Serie Agricultura – Produção Mineral – Protesto do Gerente do Abbade – 8R –IA5 – N. 08 - CODES – 28 July 1887.

²⁶ *Exchange value* of the U.S. Dollar to Brazilian Réis in 1887 was US\$ 0, 46 / 1\$000 Rs or 2\$174 Rs / US\$ 1, 00, this way 1.000.000 (one Conto de Réis) / 2.174 (Réis/Dollar) = 459, 98 Dollars (Cunha, 2010).

was prompted by disagreements with the *Meia Ponte* family (Jayme de Sá) who controlled the economic and political spheres of the town. Supporters of Arena's actions were few and they included the *Marquez do Tocantins* (who did not agree with the slow of the process);²⁷ and Herculano Fleury Curado of *Corumbá de Goiás* (who was the former owner of the *Lavras do Abade*).²⁸ The resolution of the majority of the claims was always found against the CMG Company, except for the decision in 1889 made by one of the directors in the Ministry of Agriculture, Commerce and Public Works, Machado de Assis.²⁹ This decision was too late, however, because a few days prior, the Imperial government was removed, and the decision was not executed by the new military Republican government.

In 1892 Oscar Leal (1892), repeated the Saint-Hilaire visit to the *Pireneus* mountains. According to Leal, the remainder of the village included only twelve standing houses and several ruins of others; the damaged aqueduct; and the burned sawmill structure. The explorer was approached by an old man called Ignácio, and he observed that the machines, pipes, instruments, and iron pieces were exposed to weather or were collected in stone wall buildings without doors. Leal also noted that in the years following abandonment and during the rainy season, some people from around villages appeared at the locale to recover the gold that fell from the ravine and other remains.

The causes of conflict according to the historical documents are found to be based to a great degree in the mine pollution of the *Almas* river and the insubordination of the mine manager to the province's order to close the mine. However, other causes in the same historical documents also could be related to the disagreement between Alfredo Arena and *Meia Ponte* village authorities, such as the case of *Bugre*.³⁰ Nevertheless, the singularity of the *Lavras do Abade* conflict made it a unique event in the Brazilian and *Goiás* history of the nineteenth century.

²⁷ AN – Boullier – Serie Agricultura – Produção Mineral –Letter from Marquez do Tocantins to Alfredo Arena – 8R –IA5 – N. 06 - CODES – 24 August 1887.

²⁸ AN – Boullier – Serie Agricultura – Produção Mineral – Letter from Herculano Fleury Curado to Alfredo Arena – 8R –IA5 – N. 06 - CODES – 29 January 1888.

²⁹ AN – Boullier – Serie Agricultura – Produção Mineral – Letter from Machado de Assis to João Chaves in the Commercial Directory – 8R –IA5 – N. 06 - CODES – 16 December 1889.

³⁰ The case concerned a mine employee of the *Lavras do Abade* who was acquitted at trial because of Arena's close influence to the Imperial Government. The miner was accused of murdering a soldier from Major Jayme de Sá's troop in 1886, but was absolved of the crime.

The incident was a singular conflict against a private enterprise, described in period accounts as caused by the pollution of water resources and executed by an assailants group in nineteenth century Brazil.³¹ The *Lavras do Abade* conflict was an act of *coronelismo*, perpetuated by the rural *Meia Ponte* oligarchy against the entrepreneurial actions of the CMG Company.³² The village destruction was a terrible result, and the assault against the mine was not a justifiable protest against the water pollution sponsored by Alfredo Arena. On the contrary; it was possibly a conflict generated between two forms of "seeing the world", one illuminated by the yellow of the gold and another maintained by the green of the plantations.

The *Lavras do Abade* conflict was a unique event in the history of *Goiás*; and it also carries within it a mosaic of issues that are at the same time the origin and consequence of economic and political disputes between the villages and personal interests in the region. What could be concluded about these historical documents is that the environmental claim was not the only cause of the *Lavras do Abade* conflict; however it was used more as an excuse. Other factors of the *Lavras do Abade* conflict must be individually understood, and to achieve this goal it is necessary to look beyond the historical documentation by considering further founts of information, such as: material culture, oral history and environmental data.

Farmers vs. Miners in the *Pireneus* Mountains

Anthropologically, the *Lavras do Abade* event is viewed as a capitalist enclave in the *Goiás* agricultural province, because of the relations of production employed in mid-western Brazil at the end of the 1800's. However, to better understand this process, a series of definitions must be created regarding the productive relationships in the mining village. Therefore, I do not intend in this short conclusion to discuss the primordial mode of production in the context of *Lavras do Abade*, but to make a correlation between the historical, archaeological and environmental facts presented. In doing so, I try to characterize what the productive relationship practices were, and relate the possible elements in the

³¹ Numerous revolts in the period of Imperial Brazil were a demonstration of the inequalities among the Brazilian nineteenth century society. As a result, principal popular revolts in the period, such as *Praiera* in Pernambuco, *Cabanagem* in Pará, *Malês* and *Sabinada* in Bahia, *Farroupilha* in Rio Grande do Sul, and *Balaçada* in Maranhão, were characterized mainly as social claims. Nevertheless, neither these nor others economic or political conflicts in the same imperial period contained any origin, development or legacy, as occurred in *Lavras do Abade* conflict.

³² To see more about the importance of Brazilian elite actions to the 19th century context (Needell, 2006, 2010)

history of *Lavras do Abade* with the notion of forces of production and relations of production. However, I understand that a broader exploration of the subject is necessary, and so is the need to identify whether there was “one” primordial mode of production, capitalist or pre-capitalist in the *Lavras do Abade*. On the other hand, it is not a simple study, and as a result in this conclusion, I only identify and characterize the elements according to the historical materialism methodological approach.

According to Godelier (1977), the contradictions that arise in the social structures characterizing the functioning and evolution of social relations can be distinguished between internal and external proprieties. Likewise for Lobban (in: Fluehr-Lobban, 1968), the concept of contradiction exists and is based in a relationship between opposites, which are composed by internal and external relationships. The internal contradictions are the contradictions themselves while the external contradictions exist between bodies of relationships, which last at a higher and different level and may also represent internal contradiction within another system of relations. In addition these contradictions may also be anti-antagonistic or antagonistic to those which are characterized by process of dialectical negation, which reflect the climax in which the antitheses has reached the point of qualitative change, and has begun the synthesis of new relations.

In the external context of the *Lavras do Abade* mine, two types of social groups can be identified and divided between the miners and the farmers. The farmers have as a productive force the agriculture and livestock, while the means of production are represented as farms and cattle and the relation of production is crystallized in the colonel and peasant classification. Therefore, according to Godelier (1977), the cooperation in production among pastoral people is not necessary as it is among agriculturists, because the main production of the first is the mobile resource of wealth, which circulates in marketable or non-marketable forms and increases at great speed, in comparisons with land in agricultural societies. Another distinction about the farmers is that they do not have a classical division into two opposed classes as Donham (1999) observes: the capitalists who control the great mass of productive powers, versus the workers who control no such powers, except their own capacities for labor. Nevertheless, they obey some rules based in principals of vassalage and suzerainty, as in the feudal system, where the relation of production is dependent upon possession of land, where exploitation occurs through reciprocated contract, and where the ruling class is usually a nobility or aristocracy.

In the internal context of the *Lavras do Abade* mine, we can observe that the productive forces are identified as the mining process development. While the means of production are

characterized by the archaeological vestiges and the segmented space, the relation of production is identified between the owner of the means of production, in this case Alfredo Arena, and probably some other individual such as the storekeeper, who has similar relations of production to the productive forces. This consists of the primary form of property, or the possession of things and services through state guaranteed contract, where the form of exploitation is wage labor, and the ruling class is the bourgeoisie, which exploits the proletariat. Therefore, following Marx, Godelier (1977) insists that the labor itself has no price. It is the manpower that has a price, because nothing is more mysterious than the difference between the total values created by the use of manpower and the fraction of this value which is handed to the producer, in the form of wages. Following Marx, the division of labor only happens with the separation of industrial from agricultural, and hence with the separation of town and country and the conflict of their interests.

Talking about conflict, Gosden (1999) presents that there exists relative poverty in anthropological writings by both Marx and Engel on this specific topic; only a series of basic principles exist that pertain to the process of labor and the social and ideological relations, which are separated into two artificial elements: the general philosophical approach and the historical scheme of social change. One of these principles is dialectical thought that is centered on the view that an idea can only be really understood in the context of its contrary (or conflict) and ultimately understood through the synthesis, that is a product of thesis and antithesis. However, according to Marx, the dialectic is also applied to social change, where the societies have a mass of internal contradictions, which were the cause of major changes. Consequently, the conflict between the *Lavras do Abade* and *Meia Ponte* villages can be seen as a conflict of productive forces in the establishment of a major mode of production. Where on one hand the farmers can compound a thesis and on the other hand the miners are the antithesis, which result in the “Water War” and village destruction or the synthesis. Once these two segments planted its germ of contradiction from inside, the potential fault lines along which tensions tend to build up are routinely dissipated by small re-adjustments, or are sometimes violently resolved by radical realignments as in conflict.

According to Marx (in: Donham, 1999), at a certain stage of development of productive forces in any society, conflict within the existing relations of production is inevitable. From forms of development of the productive forces, these relations turn into their fetters, and begin an epoch of social revolution. With the change of the economic foundation, the entire, immense superstructure is more or less rapidly transformed. Because as predicted in the same

nineteenth century; “The history of all hitherto existing society is the history of class struggles” (Marx & Engels, 1849).



Figure 3-1. Alfredo Arena – (Philermon, 1883).



Figure 3-2. Miners working – (Philermon, 1883).

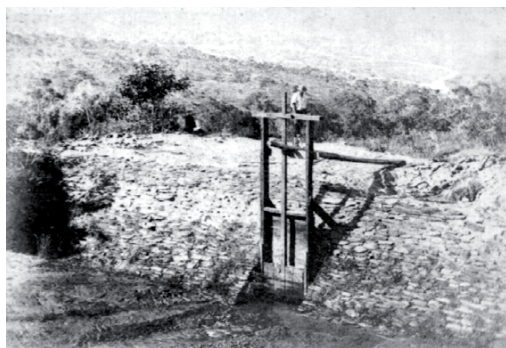


Figure 3-3. Stone dam – (Philermon, 1883).



Figure 3-4. Wooden flume – (Philermon, 1883).



Figure 3-5. *Lavras do Abade* mine – (Philermon, 1883).



Figure 3-6. *Lavras do Abade* village – (Philermon, 1883).



Figure 3-7. Store and warehouse – (Philermon, 1883).



Figure 3-8. Village canteen – (Philermon, 1883).



Figure 3-9. Drover's house – (Philermon, 1883).



Figure 3-10. Village smithy's – (Philermon, 1883).



Figure 3-11. Sawmill and watermill – (Philermon, 1883).



Figure 3-12. Arena's house – (Philermon, 1883).



Figure 3-13. Miner's house – (Philermon, 1883).

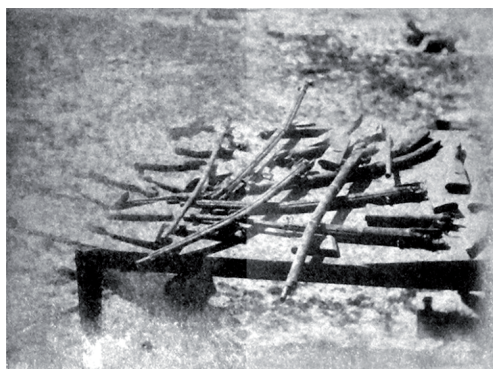


Figure 3-14. Weapons destroyed – (Goyana, 1887).

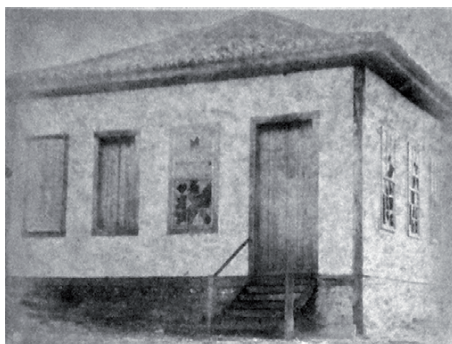


Figure 3-15. Damages in the house – (Goyana, 1887).



Figure 3-16. Damages in the house – (Goyana, 1887).



Figure 3-17. Damages in the canteen – (Goyana, 1887).



Figure 3-18. Damages in the flume – (Goyana, 1887).



Figure 3-19. Damages in the watermill – (Goyana, 1887).



Figure 3-20. Damages in the sawmill – (Goyana, 1887)

CHAPTER 4

ARCHAEOLOGY OF *LAVRAS DO ABADE* SITE

***Lavras do Abade* Historical Archaeological Site**

The site is located at *Lavras do Abade* Farm and *Cabaçeiros* Farm in an environmental protection area (APA) of State Park *Pireneus* mountains in *Goiás* – Mid-western Brazil. These farms are situated 10 km from *Pirenópolis* city and 18 km from *Corumbá de Goiás* city. The site is at approximately 800 meters from sea level and is located at coordinates UTM 8247732 and KM 0726306, with WS84 datum. High altitude *Cerrado* (Brazilian Savanna) is the predominant form of vegetation, and the most proximal water source is the *Almas* river. The soil is composed mainly of gravel (Huckleberry, 2006:340) with a coloration that varies between white and gray, while the presence of quartz and silica is always constant.

The urban nucleus, which serves as the object of this study, has an estimated area of 2,500 squares meters, with remaining stone structures measuring a maximum of 3 meters tall. The location of these structures is in an open area with vestiges of material culture (ceramic, glass and metal) and constructive elements (roof ceramic and nails) dispersed in superficial arrangements. Almost 75% of the site is preserved, with wind, rain erosion, and vandalism as the main destruction factors. The other areas of the site were not yet specified, but they include building structures, roads, and defense walls, as well as mines and milling structures, wood and clay extraction areas, and channels and dams to manage creeks, rivers and waterfalls.

Archeological Fieldwork

The archeological fieldwork in *Lavras do Abade* site began in 2003 when, to conclude my master thesis (D. M. Costa, 2003), I began a survey around the site (David, 2006:09). The first contact was not a systematic archeological survey, but a first step to understand the location and composition of more exposed structures. The act of walking around the village was completed with aerial photography and preliminary measurements of the building remains. This initial work was necessary to create a map of the site, and this in conjunction with the historic photos of 1883, was used to identify the building structures, roads and defense walls.

The second, and systematic, fieldwork occurred in 2005 as the completion of my master's thesis and the beginning of the doctoral research proposal. In 2005 the identification of the urban area was completed through systematic walking transects and the digitalization of some building structures with a 3D laser scanner.¹ The result of the walking transect was a broader view of the village and its limits, with the identification of auxiliary structures such as the stone aqueduct, walls and mine entrance (Molyneaux, 2005:121-122). On the other hand, the 3D digitalization of construction structures was first an action of preservation of these remains in an electronic platform, which through the capture of dimensions, texture, and color; makes it possible to virtually replicate their exact form. Second, the digitalization permits the study not *in loco* of the structures, and the reproduction of these elements in 3D models² with combination of others data, such as the documentary information (oral, written or iconographic) and archeological information.

The last fieldwork campaign occurred in 2007 and 2008, first with geological and environmental observation of the area around the site. In 2007 some prospection was made in the urban area to identify the depth of the soil deposits and the occurrence of archaeological vestiges at the surface. The surveys did not collect materials or expose the archeological strata, but were nonetheless fundamental in preparing the following campaign of 2008. In 2008 the first archaeological excavation on the site was begun. With few resources and members, two weeks of test pit and surface collecting were completed in the selected three areas: the administration house, the store and warehouse, and the sawmill and watermill.

Methodology of Survey and Excavation

The selection of the location for the excavation units was a combination of building structure orientation and documentary research indications (Glassow, 2005:154-155). Each construction was selected based on the representative information according to the

¹ The digital survey was made by the scanner positioned in many places around the object to totally cover the studied structure. The digital survey was made by the capture over 20 millions points in X Y Z axes and digital photogrammetry with the laser scanner Trimble/Mensi 3D GS200. The GS200 has resolution down to 32 μ rad (3mm at 100m) with accuracy down to 1.5mm @ 50m, speed of capture is up to 5000 pts/s and a laser Class 3R (IEC 60825-1) / Class 2 (21 CFR §1041.10). Beside the digital scanner all the points were geo-referential to creation of a topographic plane by a GPS receptor Z-Max of dual frequency with precision of 5mm + 0,5 ppm and a GPS receptor Promark2 of frequency precision 5mm + 1ppm. The conclusion of this phase was the construction of a point-cloud file of the objects, and in CAD file. (See figure 7-1)

² The 3D models were constructed with software Google SketchUp Pro Version 6.4.112. (See figure 7-2)

preservation state of the remains, the area that occupied in the site, the history of occurred attacks, the socioeconomic distinction among the others, and the private and public conditions.

The vegetation in the area of the excavated units was cleared only when necessary, and the connection among the units was executed through small trails in the *cerrado*. The options for this action were limited by the environmental impacts and increases of erosion in the area; avoiding excessive visits from the external public to the site; and conserving the remaining structures that are still sustained by the vegetation.

The archaeological techniques employed include surface collection and limited excavations, opening up a total of 10 1x1 meter units (Glassow, 2005:152), each dug between 05 and 40 cm below ground surface. Excavations began with the identification of natural strata, inside which the sequence of arbitrary levels of 05 cm increments was employed (Harris, 1989:15). Horizontal orientation to each excavation unit was established using the north/south and east/west axes aligned with true north, and recognized using a pocket transit. Vertical controls were established and maintained using a laser level³ and a laser meter,⁴ as rule, and the vertical datum was an arbitrary 1 meter above the southeast corner of each excavation unit.

Excavations were conducted almost exclusively using hand trowels and paintbrushes; picks and shovels were used only in unit 11 below the 10 cm depth. All fill was screened through 05 cm mesh and in some cases 03 cm mesh. All archeological material was collected with the exception of roof tile, which occurs in almost all units and was retained only to create a reference collection of each building. In total, approximately 53 fragments of ceramics, 57 fragments of glass, 15 fragments of metal, 211 fragments of flat glass (glass windows) and 92 fragments of pottery (roof tile) were collected.

The stratigraphy (Balme & Paterson, 2006:97) of the site was classified following the Harris Matrix principals of sequence numeracy (Harris, 1989:34), and the data was registered through pictures and drawings of stratigraphic sections only from selected units. This decision was made because the cultural deposits (Mills & Vega-Centeno, 2005:205) in most

³ The laser level used was an Inventek self adjusting laser level *V21384* with error of plus or minus four degrees, and two laser lights for vertical and horizontal leveling. In some cases the laser-enhancing glasses were necessary to see the laser line in bright lighting field conditions.

⁴ The laser measurement was realized with a Stanley FatMax TLM100 77-910, with accuracy of $\pm 1/4"$ ($\pm 6\text{mm}$) at 100-ft (30m), range of 2'-100' (0.6m - 30m) and laser of 650 nm, Class IIIA.

explored units were relatively shallow, and to privilege the bordering units to create a broader vision of the stratigraphy of the site.

The deepest cultural deposits extended only 30cm to 40 cm below the surface, with two exceptions, and most materials ranged from surface to about 10cm below the surface. Stratigraphy of the site typically consisted of a humus (Huckleberry, 2006:345) fine sand from the surface down to approximately 05cm to 10cm below the surface, followed by a second layer with archaeological roof and floor remains (Glassow, 2005:153-154) until 20 and 25cm, under which lay a sterile concentration of gray and white gravel.

Every excavation unit was mapped, and some structures (roads and walls) were identified on the map for future localization of units. After the excavation, all units were back filled and a black plastic trash bag was placed in the bottom to identify the archeological intervention limit.

Written documentation of the excavation was composed of field diary by the coordinator and record forms to each level in the excavated units with a summary description and sketch map of the top level recording the *in situ* placement of individual artifacts, features, tree roots, etc. The digital photo documentation of each top level and excavation overviews was registered in specific form with date, location, and number of pictures. The general archeological work was also recorded in digital video clips with oral reports of the activity and students' statements.

The Administration House: a Household Unit.

The excavation in the administration house, which was also the residence of Alfredo Arena and domestic slaves began with the cleaning of the terrain to open the 1 x 1 meter unit. The location of the units was established with accordance between building structures and documented information. First, two internal areas were selected to be explored, almost certainly the bedroom and the kitchen, and secondly the internal patio, in the middle of the structure and adjacent to the limited stone wall. The area was covered by dense vegetation, including average and large trees and stone structures identified as the limited walls from the external patios and alleyways that connect the buildings.

The first unit to be opened was identified as unit 11 in the southwest corner of the administration house, located 6 meters from the external wall and probably inside the bedroom or another room of the house. The surface strata do not reveal any indication of archeological material until 03cm below the surface. After the initial 03cm in the unit 11 a

layer of roof tiles appeared, characterized by sparse amounts of material, in some cases large fragments. All these roof tiles were in a horizontal position and with sequential fractures that did not demonstrate any type of disturbance. The roof tile layer ended at approximately 08cm below the surface, at which point it was replaced by a very thick gravel stratum with blocks of 1 x 1 cm. This gravel stratum was explored to a depth of 30cm, but did not contain any archeological material.

The second unit open was the unit 12 in the northeast corner of the administration house, probably the kitchen area, and near four meters of the external wall of the house with another structure not identified. Until reaching a depth of 05cm, no archeological remains were identified, but after the initial 05cm in the unit a layer with concentrated roof tiles was discovered. This layer was composed of well preserved roof tiles with large concentrations and huge samples. Despite the horizontal position, some of these roof tiles also appear over the position of other remains. All material was plotted and a quantity of the objects collected. Following the roof tile layer, a gravel stratum similar as in the unit 11 was identified. However between the layer and the stratum an iron square nail was found in the north wall of the unit.

The third unit was unit 13, localized in the middle of the internal patio and in a straight line with unit 11, but 20 meters to the north and 5 meters from the external wall. This unit was located in disperse vegetation with grass and small trees, and probably in the open area outside of the administration house. The first 03cm below the surface were similar to the previously described unit, however no roof tiles were identified after this stratum, but only the gravel stratum like the other units.

The fourth and last unit to be excavated in this area was the unit 14, a distance of 20 meters north of unit 12, in an area with vegetation also composed by middle grass and small trees. This unit was located seven meters from the east wall and one meter from the south wall, most likely in the internal courtyard of the house. In the initial 03cm below the surface a ceramic fragment from the southwest corner was found in the sieve. But after digging 05cm below the surface three more fragments of ceramic *in situ*, or in a horizontal position and with sequential fractures, were discovered in the northeast portion of the unit.

The stratigraphy of the area was initially composed of finely granulated sand with brown to dark humus until approximately 05cm below the surface. This stratum was characterized as level 0 and presented very small roots, mainly from the grass and no correlated archaeological remains were discovered. The second level, defined as level 1, was characterized by the roof tile layer until 13cm below the surface, which occurs in the units 11

and 12 inside the building structure. More thick roots appeared at this level, as well as associated constructive material including iron nails, probably from the wood roof structures.

The third level in sequence was defined as level 2, and corresponds to a gravel concentration with medium to thick granulation and gray to white coloration. This level was defined as a type of landfill and contained archaeologically sterile soil, despite being investigated at unit 11 to a depth of 30cm, but without reaching the matrix rock. The fourth level was designated as level 4 and occurs only in the unit 14, corresponding to fine, brown, clear sand with archeological material – ceramic fragments. This level cannot be clearly associated to a floor level, because it is present outside of the building structure, but is probably connected with a cultural level deposit related to the occupants of the house.

The spatial distribution of the archeological material and features also reflects the characterization of the area as a residential unit. The first two excavation units, 11 and 12, appear inside of the house, despite the lack of a visible floor layer, and were marked by the presence of roof tile layer and associated constructive elements. The objective here was to archeologically identify the building unit that was destroyed by the location of roof tiles, which, according to photographic documents, likely serves as the main indicator of the administration house. The roof tile is also associated with the socioeconomic status present in this building, which was the central control of the mine and residence of the owner.⁵

The external excavation units 13 and 14 reflect a practical deposit conditioned by hygiene rules of the time. The location of an ordinary element in earthenware in the most distant unit from the building structure indicates the localization of a domestic archeological deposit. However the non- identification of any vestige in the unit localized between the end of the internal patio and the house defines this space as a transit space between other buildings that could compound the urban conjunct of the area. This characterization is also sustained by the identification of a stone pathway that connects the administration house to others buildings, as well as the presence of what was most likely a gate in the wall.

The Store and Warehouse: a Commercial Unit.

The excavations of the store and warehouse followed the same strategy as that of the administration house; after clearing the area, three excavation units were established. The area is characterized by sparse vegetation with medium grass and small trees, and is located

⁵ See the laboratorial analyses of roof tiles in this chapter.

on the other side of the road that divides the village between the sawmill and watermill. The place was first characterized without structures to guide the location of each unit, because this was defined as a distance of 20 meters west of the canteen remains. However, a small stone line was identified in the area, and a space of five meters to each of the first two units was defined, in the north and south directions, to cover the probable external and internal area of the store and warehouse.

The first unit was identified as unit 21; its location was possibly restricted to the internal area of the building, characterized by initial centimeters of ash accumulation in the west portion of the unit, and brown sand with fine granulation in the rest. Roof tiles and glass window fragments were founded from the initial levels until a depth of 10cm, where a fragment of a medicine bottle was collected in the southwest corner. After the initial 10cm the ash dispersion was constant and isolated stones, most likely from the walls, were found.

The excavation from the surface to a depth of 15cm below the surface uncovered fragments of glass from both a window and a bottle, and also an iron nail. At a depth of 20cm of depth, the strata changes to a brown-red coloration, first in the west portion. Therefore the archeological material (glass and metal) does not stop, and it is possible that this material was associated with intrusions of first stratum in the second stratum. The brown-red stratum remains present until a depth of 40cm, at which point two concentrations of constructive material (roof tile or bricks) in the south and east walls of the unit appear.

The second unit was defined as unit 22 and was probably open in the external area of the building. The initial stratum was marked by a huge concentration of thick gravel, up until a depth of 03cm, and no archaeological material was collected. The unit was abandoned after reaching 05cm below the surface, having not uncovered any archeological features.

The third unit was classified as unit 23 and it was opened between units 21 and 22, but located 6 meters to the east of the axis formed by the two cited units. No archeological material was identified in the initial 03cm, but after the 05cm mark below the surface, a roof tile layer was found up until a depth of 10cm. The construction material deposited in the unit indicates an archaeological structure in the western portion of the unit. This archeological feature was characterized by the concentration of roof tile on one side of the excavation unit and a brown-red soil on the other (Mills & Vega-Centeno, 2005:207). The roof tile portion presented a disturbed condition with accumulation of fragments in vertical position and a limited interface presenting a human- made whole pattern (symmetrical dig and intentional fill) (Mills & Vega-Centeno, 2005:209).

The area stratigraphy began with a first level identified as number 0 and, similar to the administrative house, it is composed of small roots and finely granulated sand with humus (organic material). In sequence, level 2 is characterized by the sterile gravel in the units of the administration house. However, after the initial 05cm below the surface in unit 21, a second level, numbered 3, occurs, or the ash accumulation with a variation section in 3A, 3B, 3C and 3D. The third stratigraphic sequence is level 4, or the brown-red soil that is similar to the excavation unit 14 in the administration house which cannot be classified as a floor, but interpreted as an occupancy soil by the presence of related archeological material. The last stratigraphic segment in the area was identified as number 5, present only in unit 23, and it is composed by the roof tiles in disturbed position (vertical) and inside of a depositional feature (hole).

The spatial distribution of material and features follows the principles of internal and external location. First, in the excavation, unit 21 was characterized the presence of roof tiles in a horizontal position and ash accumulation, most likely from the wood structure of the building. Additionally, the glass and iron fragments were indicative not only of constructive elements (windows and nails) but commercial items such as bottles.

On the other hand, excavation unit 22 presented a sterile grave sedimentation that corresponds to the external condition and possibly to a transit area similar to the excavation of unit 13 from the administrative house. Finally the excavation of unit 23 shows us other external indicatives, such as the presence of roof tiles that are interpreted as marker of internal buildings. The roof tile concentration inside of an enclosed structure would indicate a specific feature outside the building, while the presence of the same brown-red stratum around the area, as in unit 14 from the administrative house, re-affirms this interpretation.

The Sawmill and Watermill: an Industrial Unit.

The excavations in the sawmill and watermill followed the same strategy as that of the other areas: first, three spaces were selected according to the building structures and documentary information, to cover the internal and external spaces of the building; second, the excavation units constituted a three dimensional map of the deposit in the place. The vegetation of the area was characterized by small and medium trees with high grass and cleared space.

The first unit to be excavated was identified as unit 31, and located in the external area of the sawmill and watermill, 6 meters from the road that divided the village. The first 05cm

below the surface was characterized by the occurrence of gravel stratum and no archeological material. The unit was abandoned after 05cm, and the area was identified as exterior to the structure, by the similarities to the external spaces in the areas of the administration house and store and warehouse buildings.

The second unit was defined as unit 32 and located near the courtyard wall of the administration house, a location that was likely selected due to the proximity of the buildings (administration and sawmill). The unit was also excavated to a depth of 05cm at which point it was determined that the anterior unit and other external units did not contain archeological material. This excavation unit also shares similarities with the excavation of unit 13 in the administration house, in terms of the proximity to a probable passage way and a near access gate.

The third and last unit was designated unit 33 and was located in the extreme north of the site between the end of the building and the entrance of the mine. The first 05cm of excavation show a fine lens of gravel and white-brown stratum with small granulation and firm consistency. No archeological material was recovered from this unit, but the presence of a brown layer is indicative of a cultural layer by association with the other two occurrences in the site.

The stratigraphy of the area was characterized first by the presence of a 05cm deep stratum in some units of surface sand with humus composition, this level was classified in the previous excavation units as a number 0. In sequence appears a gravel occurrence differentiated by the presence of eventual stone blocs with a diameter of 1 x 1 cm, identified as number 2, similar to units 31 and 32. Level 4 was categorized as white-brown sediment, without archaeological material, but with very small granulation and extreme humidity.

The spatial distribution of archaeological remains was absent, but the identification of a possible cultural layer in the excavation of unit 33 is indicative of the internal area of the building. This affirmation is in consequence of an analogy⁶ with the other two occurrences of brown colored sediments and archaeological remains in the administration house, and the store and warehouse. Unit 14 in the administration house is associated with the external area of the building, as explained by the remaining stone wall structures that delimited the space.

⁶ This "analogy" was based in the four laws of stratigraphy: the law of superposition that define that the deeper stratigraphy is oldest among the above sequences; the law of association that states that the materials in the same deposit are contemporaneous; the law of horizontal deposition that affirms that the deposit always tends toward a horizontal position; and the law of original continuity that appoints that the deposit always tends to end in a feather edge (Balme & Paterson, 2006:100-102).

On the other hand, the cultural level is represented by brown, fine-grained sand, and it is also the sediment that occurs in the presence of historical artifacts *in situ* position, which exemplify and define the level 4 in the area.

In the excavation of unit 23, similar conditions are also represented by the occurrence of archaeological material and human features and the same associated brown sand layer. However, the external condition of unit 23 in the store and warehouse is a consequence of the type of feature that is constituted by archaeological material inside a depositional structure - material that is always present in the horizontal position in other inside units. Unit 33 of the sawmill and watermill, in turn, is located inside the building, not determined by the direct presence of archaeological remains (roof tiles) in this sediment, but by the analogy with the presence of the other two human indices associated with this level. In this case the cultural level is characterized as internal because the brown sand is associated with human presence and secondly by the architectural composition of the building that is composed by open spaces without stone walls or roof tile.

Archaeological Stratigraphy and Conflict Patterns

In conclusion, the Harris Matrix of the archaeological stratigraphy of *Lavras do Abade* site (Figure 4-1) is characterized by the presence of three surface units (T, 5 and G) and four deposit units (1, 2, 3 and 4). The surface unit "T" is the top soil of the site, sometimes associated with archaeological material. The surface unit "5" is the pit, or deposit structure identified in the excavation unit 21, while the surface unit "G" is the geological interface or rock base. A layer of roof tile and construction materials (square and round nails) forms deposit unit "1". Deposit unit "2" is archaeologically sterile gravel, while deposit unit "3" is ash layer accumulation with variation in sections. Deposit unit "4" is considered the floor or soil of occupation and corresponds to the nineteenth century period.

The stratigraphic relations identified in the site were the presence of surface unit "T" above all the surface and deposit units, while surface unit "5" is above the surface unit "G" that is below all surface and deposit units. In the same way, deposit units "1" and "3" are above deposit units "4" and "2", which are the lowest of all deposit units. The temporal relations establish that surface unit "5" is later than the deposit unit "1"; while the deposit unit "1" is contemporary to the deposit unit "3"; while in its turn deposit unit "3" is later than deposit unit "4". The results observed two distinct temporal phases in the archaeological

stratigraphy of the site. One phase of occupational period (phase 7) formed by deposit units 1, 3 and 4, and another phase of destruction period (phase 6) formed by the 1 and 3 deposit unit.

The presences of the floor soil inside and outside the structures, as well as the vestiges of roof tiles and ash residues characterize the occupation phase “7”. This phase is related with the period of activity and posterior abandonment of the mine. Only the debris of the structures forms the destruction phase “6” and other archaeological vestiges associated with the period. This phase is related only with the destruction period of the mine and possibly with the attack of 1887. Not found in the excavation units, however, were any archaeological vestige directly related to the village’s assault in the interface feature between the phase “7” and “6”. The difficulty of archaeologically identifying the *Lavras do Abade* conflict resulted from the scale of the event, which did not consist of a huge movement of troops and equipment, but rather was limited to a three small assaults, similar to “guerrilla warfare,” resulting in long term looting of the goldmine.

Laboratory Analyses

Firstly, all archaeological artifacts were cleaned, except the metal, which received differentiated treatment depending on its state of conservation.⁷ Next the material was numbered according to horizontal and vertical references in the site, following the numeration sequence explained at the beginning of the section. The material was individually quantified and classified; in sequence the fragments of ceramic and glass were joined to form pieces and separated in collections according to the properties.

In this way the present intrinsic proprieties in the archeological sample can be classified in three groups: their physical properties (constituent matter), geometric (dimensions and measures), and seminological (symbols and ornaments). However not all of these proprieties can be considered separately in the study, because they together form a net of relationships. On the other hand, the extrinsic attributes of the archeological sample can be classified by two groups of tracks primary and secondary fonts, whether scientific or not. Extrinsic attributes should be studied separately, according to the information that can be added to the intrinsic proprieties of the sample, which inform chronology, spatiality, and functionality.

The research and integration of these external and internal referentials present enormous investigative potential to the material cultural heritage. In archeology, the material

⁷ The metal was wrapped in plastic film to analyses.

culture assumes the quality of register of social practices as a product of its own environment, and on the other hand, to release the ideas that built it. Like this, material culture becomes a code to be deciphered by the researcher, which depends on their intellectual arsenal and the external and internal attributes and properties of objects. With the proposal above, the material culture is taken as much as a mediator instrument and deposit of memoirs and meanings of cultural relationships among social groups, and as an analysis and research tool of these groups, as well. It is up to the archeologist to recover their historical and social meaning, because the object is a media of knowledge, mainly because it uses constructions of the individual and collective memory.

The analysis was guided by the intent to identify the technological and morphologic variables that can inform the process of how these objects were made and used. This step has the objective of explaining the sequential activities executed in the production of the artifact, which permits several indicators about the chronology and origin of these objects, as much as to determine the function of the objects and their eventual disposal.

Study of Dinnerware Sample

The *Lavras do Abade* ceramic sample is composed of 54 fragments, all of which were analyzed to determine the shape of vessel form, paste and type of glaze used, decoration technique, color employed in the pieces, aesthetic pattern of decoration, and eventually post-depositional process.

The samples were recovered in the administration house area; 90% were discovered in surface collections and only 10% of the fragments were found in excavation units. The surface collection area was made in a specific space of approximately 50 m² between the north wall of the internal patio and the aqueduct. This area was characterized as an external patio of the administration house and also served as a connection between the sawmill and watermill building, as well as the melting-house building.

The forms (Sutton & Arkush, 1998:205) identified in the sample were 2 fragments of cups, 2 fragments of saucers, 7 fragments of plates, 2 fragments of bowls, 1 fragment of a tureen, and 3 fragments of lids. In addition, 25 non-descript fragments were classified as flat, and 9 as concave. The great concentration of fragments occurs with those that are flat, and not otherwise attributed to a specific form, followed by the concave fragments which similarly do not have a specific form. The other categories of fragments are distributed in

almost equal forms (cups, saucer, bowls, tureen and lid), with exception of the plate fragments that represent three times the quantity of other forms.

The predominance of the plate fragments over the others forms does not suggest a dominance of plates over the other dishes, but a representation of a dinnerware that is formed by the individual and collective alimentation paraphernalia. In this case, the occurrence of plates during the period could also be related with the consumption of solid food than the consumption of liquids, which would be kept in individual bowls.

On the other hand, the prevalence of fragments related to individual consumption, such as plates, and also serving dishes, such as tureens, could be indicative of social and economic status. These complete dinnerware sets are more employed in events as a display dinner and are associated with the existence of well decorated ceramics, individual portions, and many serving dishes, probably demonstrating socioeconomic and cultural rules.⁸

The cup, saucer, plate and bowl fragments were found in the southwest corner of the administration house, while the lid was more distant in the north. This projection of fragments is interesting because the probable area of the kitchen in the house is in the northwest corner – opposite of where the fragments were found. Similarly, the majority of flat and concave fragments also occurs in the southwest corner of the collecting area, although the presence of flat fragments extended to the extreme north and northwest portions.

The distribution of these fragments, all obtained from surface collections, is related to the unique access between the internal and external patios in the administration house, which is granted by stairs. The division between the internal and external patio is made by a stone wall that would be interpreted as retention system to the erosion sediments that occurs in the south to north direction in this area of the site. On the other hand, one plate and all tureen fragments were found in the northwest corner of the internal patio. The location of these fragments is in agreement with the probable location of the kitchen in the house.

The type of paste identified in the sample was 9 fragments of porcelain (Eberlein & Ramsdell, 1925:15), 38 fragments of earthenware (Sutton & Arkush, 1998:203), and 4 fragments of ironstone (Godden, 1966:xxiv). The majority of fragments of the earthenware would be linked to kitchen paraphernalia, and in most cases the tea or dinner table services. During the period of the sample, the earthenware was also broadly distributed and, with a cheap value, was also broadly acquired. On the other hand, the small quantity of porcelain

⁸ Service à la française (or *Buffet*) is the practice of serving all the dishes of a meal at the same moment.

does not represent a clear preference for this type, but rather a relationship between the easy accessibility of earthenware (mainly British) in the period and the exclusivity of artifacts in porcelain. One or two small objects, most likely a small saucer and cup can characterize the porcelain artifacts in the sample. Similarly, the small quantity of fragments of ironstone is associated with objects related to hygiene activity, such as bathroom paraphernalia or a cosmetic pot .

The spatial distribution of this category was the same as the form category, with the peculiarity that the earthenware had greater distribution within the area. The porcelain and ironstone were confined to the southwest corner of the collect area, while the earthenware was present in all areas except the extreme north of collection area. The earthenware disposal is related both to the quantity of sample of this type of ware, which was collected in four time's greater quantity than the other wares, and also to the density of material that would be more disposable to water erosion transportation than the others, because its low density .

The type of glaze found in the sample was classified as 1 fragment of creamware (Hume, 2001:123), 4 fragments of pearlware (Sussaman, 2000:37), and 33 fragments of whiteware (Kwas, 1999:3). The massive presence of whiteware glaze is expected for the end of nineteenth century studied, as it was employed in all forms of earthenware and is therefore predominant. Similarly, the same principal explains the small portion of pearlware and creamware in the sample. The spatial distribution of glaze also presented a pattern, while the creamware and pearlware glaze were found only in the fragments that occurred near the southwest corner of the collection area, and the white were glaze was present in the entire area. Following the principal of quantity, this is logical given the majority of whiteware fragments in the sample, while the fixed location of the creamware and pearlware fragments near of the administration house, would indicate an antiquity of these deposits.

The two categories of decorative technique identified in the sample were 12 hand painted (Sutton & Arkush, 1998:211) fragments and 1 fragment with a decal (Sutton & Arkush, 1998:211) type decoration. The hand painted prevalence is present in the earthenware tureen and bowls fragments, while the decal technique of decoration is present in the ironstone pot fragments. The hand painted technique decoration in the earthenware is common in the studied period, as is the decal technique in ironstone objects.

The color variety in the sample is represented by 1 dark blue fragment, 11 black fragments, 1 yellow fragment, 4 red fragments, 8 green fragments, and 6 lilac fragments. Black is the most common color, followed by green, lilac, red and dark blue and yellow tied for least common. The distribution of colors is not a good reference for time or place, but

their association with the decorative technique and pattern is relevant to define the period and location of production.

The decorative pattern is recognized as 11 fragments presenting the band motif (G. Miller, 2000a:92), and 6 fragments with the flower motif (G. Miller, 2000a:93). The band motif is the double of the flower motif, though the flower motif occurs in association with the band motif in all samples. The combination of band and flower motifs is the result of the hand painted technique that present beside the annual or banded design, also the floral stamp pattern decoration.

Finally, only one fragment, found in the southwest corner of the collection area, presented post-depositional fire marks.

Study of Glass Bottles Sample

The glass samples collected from the Lavras *do Abade* site were analyzed for the following proprieties and attributes: part, color, form, function, mold, type of base, type of pontil, diameter of base, and pos-depositional marks. The majority of glass samples were recovered from the administration house, more specifically in association with the ceramic sample collected from the surface of the external patio. Also there was a small portion of medicine bottles fragments from the store and warehouse, as well as, the less representative amount of flat glass (windows) from one excavation units in this building.

The parts (White, 2000:139) of the glass bottle samples were classified as 1 fragment of base, 49 fragments of body, 2 fragments of push-up, 3 fragments of shoulder and 4 fragments of the neck of a bottle. The fact that the majority of fragments were identified as being from the body of a bottle is due to the area's correspondence to the main portion in extension of the glass bottles. On the other hand, the neck and shoulder correspondence in second and third place is due to the association between these two parts in the same space between the body and lip. Nevertheless the base and lip are usually the most preserved parts of glass bottle samples in the archaeological record, as they contain more glass than other portions. However, only one base of glass bottle was found.

The base, neck and push-up samples were concentrated in the southwest corner of the external patio, while the shoulder and body parts were more greatly distributed. The location of the base and push-up near of the "primary" disposal zone is expected given the glass volume that this part of bottle has, and as the same is expected with the neck and lip portions. The body parts area distribution following not only the quantity of reminiscences that was

collected, four times the others parts, but also the little density of this type of remains that is favorable to transportation by many types of erosions. In the same way that the shoulder glass bottle samples that can be associated to the body part than the neck has also the same comportment in the external patio spatial distribution.

The color (Firebaugh, 1983:25) is not always a reliable attribute in archaeological studies of glass bottles, and the sample presented 5 fragments in green, 5 fragments in amethyst, 14 fragments in blue, 1 fragment in black and 32 fragments in purple. While the majority of fragments were purple, followed by blue fragments, and this could be explained by the relationship between this type of color with hygiene and medicinal use. Conversely, black, green and amethyst colors also could be related with alcoholic and soda bottles respectively. The spatial distribution on the other side presents a complementary pattern, as, amethyst and green fragments were concentrated in the southwest corner in proximity with the administration house, while the blue and purple fragments were broadly distributed in the area. The sole black colored fragment was only found during the store and warehouse excavation.

The form (Lawrence, 2006:371) classification was such that there are 9 cylindrical bottle fragments, 8 rectangular bottle fragments, 38 cylindrical medicinal bottle fragments and 2 rectangular medicinal bottle fragments. The huge percentage of cylindrical medicinal bottle fragments is unexpected, partly because of the direct relationship of this kind of form with medicine and hygiene and partly because the projected incidence of more samples related to beverage and alcohol consumption. The presence of numerous samples related to beverages, mainly alcoholic, in mine-camps is a common pattern in this type of the site (Baxter & Allen, 2005:72). Additionally, the presence of a majority of fragments related to medicinal and hygiene practice would be explained by a diversity of approaches, as elaborated in the next commentaries. The spatial distribution of bottle forms do not demonstrate any peculiarity, other than with the concentration of rectangular medicine bottles in the southwest corner of the collection area. The other categories presented a great distribution, despite the cylindrical medicinal bottle appearing in almost double quantity of the others – a category without a broad distribution in the external patio.

The samples were classified by function, with 6 fragments related to alcoholic beverages, 51 fragments related to patient medicines (O. Jones & Sullivan, 1989:71) and 21 fragments related to hygienic purposes (O. Jones & Sullivan, 1989:71). As discussed above, the high concentration of medicine and hygiene fragments would be related first with the location of the collection in the administration house, next to which stood the management

office and residence of Alfredo Arena. Besides being an engineer, the owner was also trained in medicine and a variety of other activities, and the concentration of patient medicine and perfume or cleanliness recipients illustrates the medical assistance that the administration house offered to the village.

The spatial distribution of this category presented a slight concentration of alcoholic beverage containers in the southwest corner, in contrast to the dispersion of the other two categories in the external patio. The broad coverage of the medicine bottles is expected given the major quantity of this type of bottle - twice of the other two categories - while the presence of the hygiene category also follows the quantity pattern previously established. Neither the store nor warehouse presented fragments related to the hygiene bottles, but only alcoholic beverage (a majority) and patent medicine. This pattern is the expected occurrence in historical mining sites, as discussed above.

In terms of the molds identified in the sample, 8 fragments presented probable bottom-hinged or three-part molds (Sutton & Arkush, 1998:190), 1 fragment presented only the three-part mold marks, and 48 fragments presented indication of full-height mold. The prevalence of full-height molds are not diagnostic because the bottom-hinged or three-part mold are also two of the full-height mold types.⁹ On the other hand the association of bottom-hinged and three-part molds is a chronological indicator for the sample. The quantities in the sample of each type of mold represent a time difference, as the bottom-hinged mold was manufactured only until the end of nineteenth century, at which point the three-part mold emerged.

Only two fragments were identified as bases with push-up (O. Jones, 2000:150), but with no identification of any pontil (O. Jones, 2000:155) scar, and were probably industrial machine made (G. Miller, 2000b:8). On the other hand the post-depositional mark is presented as fire application over the fragment and was recognized only in one of the push-ups. These two bases had diameters of 10cm and 8cm respectively, which could indicate that these bottles were mostly likely used to store alcoholic beverages. The spatial distribution of the mold types was not different from the other categories analyzed, with a small concentration of the three-part mold in the southwest corner. The other categories were presented in the entire collection area. However the isolation of three-part mold fragment is not interpreted as a pattern but rather a unique occurrence. It was not possible in either the

⁹ Include all types of mold that form the base, body and shoulder of the bottles.

store or the warehouse to identify a specific type of mold, though all fragments were catalogued as nineteenth century full-height molds.

Study of Construction Materials Sample

Aside from the cylindrical and rectangular fragments of glass connected with bottles, the sample also includes flat glass associated with window panes (Sutton & Arkush, 1998:196). This flat glass was divided according thickness: 21 fragments of 1,5mm, 133 fragments of 2mm, 51 fragments of 2,5mm and 4 fragments of 3mm. The fire marks identified on two fragments were found only in the fragments of administration house.

The spatial distribution of flat glass in the store and warehouse area was divided according to the thickness of fragments. In this case, excavation unit 21 presented flat glass fragments between 1.5 to 2mm, while excavation unit 23 presented glass of thickness of 2 to 2.5mm. This variation is interesting, first because the virtual reconstruction of the building identifies windows in this both directions, on the north wall (unit 21) and west wall (unit 23). Second, the difference of thickness in the glass windows of both sides of the building could suggest a variation related to different periods of installation of this material in the frame, or maybe a replace.

The spatial distribution of flat glass in the external patio area was almost homogenous; the four thickness categories were present in an adjacent area of the house. The location of this material near the house is entirely expected, but the concentration of any measurement pattern to confirm the tendency to 2mm thickness of the glass window is not. No window with more or less that 2mm thickness was identified in the collection area. However the only two flat glass fragments with fire marks were found in the external patio area and associated with ceramics. These marks were most likely interpreted as the result of an isolated fire.

The sample of metal artifacts at the *Lavras do Abade* site was studied according to the type of metal, whether it was an alloy, the technology of transformation from ore to object, and the category which it was used. The metal category was the only material that was equally present in the administration house, the store, and the warehouse building area (Table 4-4). The sample was identified as composed of two types of metal: 14 fragments of iron (Henderson, 2000:211) and 1 fragment of zinc (Henderson, 2000:212). Iron was identified in all the research areas, while the zinc was restricted to the administration house.

The technology (Henderson, 2000:221) used to transform the raw material was classified as follows: 12 fragments manufactured by melting and smelting and 3 fragments

manufactured by the hammering and annealing process. The artifacts created through melting and smelting were equally spatially distributed in all area of research, while the hammered and annealing artifacts were found only in the administration house and external patio area.

In the construction category the fragments were disturbed in cut-nails (Wells, 2000:323) and wire-nails (Wells, 2000:326). All together, there were 1 4d square-cut nail, 2 16d square-cut nail, 6 10d wire nails, and 5 40d wire nails. The predominance of 10d and 40d wire nails is not related to the period of the site, however all wire nails were found in surface collection. Almost no wire nails presented twist marks, but two objects presented bent parts, indicating that they were abandoned before being fully used. While the large wire nails were restricted to the administration house, the small wire nails are also present in the store and warehouse areas.

The 16d square-cut nails are, in turn, associated only with the administration house and were found in the excavation context with the roof tile layer. These nails are directly related to the type of construction employed. A 4d square-nail was identified probably as part of the furniture in the administration house. Another exception was a fragment of zinc (Light, 2000:10) in the external patio area that probably related to the manufactured coins on the site.

The sample of roof tiles in the site was researched through the identification of the following categories: raw materials that form the clay (Sutton & Arkush, 1998:110), the type of firing used, and the thickness of the fragments. The entire sample came from the excavation units in the administration house and compounded a layer archaeologically recognized.

The quartz presence in the sample was classified in 37 fragments with mineral between 0,1 and 1mm, 32 fragments between 1,1 and 3 mm and 1 fragment between 3,1 and 5mm. The dominant presence of small and medium particles of quartz in the sample characterized this material as of good plasticity, and without necessitating the application of another type of temper. However, the isolation of the fragments with more volumes of quartz fragments is also a spatial distinction. The spatial distribution of the quartz in the roof tile fragments presented a concentration of the fragments between 3,1 and 5mm in the excavation unit 11, while the fragments between 1,1 and 3 mm and between 0,1 and 1mm are more homogenous.

The hematite presence in the sample was identified as 67 fragments with mineral between 0,1 and 1mm, 7 fragments between 1,1 and 3mm and 16 fragments between 3,1 and 5mm. The hematite is responsible for the coloration of the clay after the firing, because the dominant presence of small particles of this material, as well as the quartz in the fragments, which suggests that this was composed by primary clay. The spatial distribution of the

hematite granulation was almost identical to the material categories. It was also present in all excavation units and in all levels.

The other minerals were distributed such that 46 fragments were identified as mica, 26 fragments as pyrite, and 18 fragments identified as a combination of both. However the mica and pyrite distribution in the sample was the most interesting case, despite the commonality of these two types of minerals in the occurrence of quartz and hematite in primary deposits of clay. The quantity of fragments containing only pyrite is a possible indicator of the clay deposit being composed by gold proximity. The pyrite gives the roof tiles a distinct “golden” coloration.

The spatial distribution of roof tiles containing pyrite was also curious, while the fragments with mica and the combination of mica and pyrite have a homogenous presence in the excavation units and layers. The fragments with only pyrite have a concentration in excavation unit 11 and only in the most superficial layer. The presence of this circumstance would be more one element in the characterization of this type of roof tile as social capital, while the excavation unit 11 is located in the frontal portion of the administration house.

The firing atmosphere (Henderson, 2000:131) of the sample was characterized as 41 fragments firing in complete or oxidizing atmosphere and 49 fragments firing in an incomplete or reducing atmosphere. The tie between the complete and incomplete process of firing the roof tile is not indicative of different technologies, but would only suggest the placement of the artifacts inside or near to the fire source. The spatial distribution among the excavation units and levels also was equilibrate and without exceptions. The isolation of one component in each type of the firing classification was the result of a small variation in each composition.

The sample was distributed by 4 fragments with a thickness of 10mm, 7 fragments with a thickness of 11mm, 17 fragments with a thickness of 12mm, 20 fragments with a thickness of 13mm, 18 fragments with a thickness of 14mm, 14 fragments with a thickness of 15mm, 9 fragments with a thickness of 16mm and 1 fragment with a thickness of 17mm. The concentration of 13 and 14mm thick samples represent the average roof tile thickness, while the variation between 12 and 15mm was expected (Deagan, 1987:125). The other measurements do not represent different types of roof tiles but rather an excess or shortage in the production. The spatial distribution among the levels and excavation units was also universal and without exceptions. In correlation with the quantity and variation the fragment thickness was equally present in the researched area.

Analysis and Interpretations of Material Culture

The ceramic and glass artifacts recovered in the *Lavras do Abade* site were also objects of chronological and economic analyses, first following the mean ceramic date formula proposed by South (2002) and secondly the ceramic index value proposed by Miller (2000a), for each category of artifacts. In contrast, the interpretation of metal artifacts was done through analysis of form and function association, and of the state of corrosion. However, because the small quantity of sample, both in terms of areal coverage of the *Lavras do Abade site*, but also in recovery units, all results presented here are impressionists and preliminary.

First, only fragments whose present decoration technique pattern were selected from the sample, once paste, glaze and form proprieties compounded a large date range 3. Accordingly, 6 fragments were selected and identified as floral cut-sponge stamp decoration type and 11 fragments identified as band and line hand-painting decoration type. The average date for the floral cut-sponge stamp was established as 1875, which is in agreement with Miller's (2000a:91) assertion that it was initially produced around the middle of the nineteenth century. Similarly, while the average date for the band and line hand-painting decoration was established as 1887, Miller (2000a:92) claims it was initially produced after 1875. Nineteen-hundred was determined to be the final date in which either decoration was produced. Second, the number of fragments was multiplied by the average date of decoration types, and later the product was dived by the sum of fragments of the sample. With this calculation, the average date of the ceramic sample of the *Lavras do Abade* site using South's formula was established as 1883.

$$1883 = \frac{\sum_{1875}^{1900} 1875 \times 6 \quad 32013}{\sum_{11}^6 17}$$

The application of a ceramic index value followed another orientation. It was first established according to the number of fragments in the sample, and the minimal number of vessels and forms. After the number of vessels was multiplied by the correspondent value of form and decorative type according to the ceramic index value of Miller, the product was then compared, to generate a scale of value for the sample. The result of the index comparison among the sample in the site revealed that the decorated bowls and tureens were more expensive that cups and plates with simple or no decoration. In this way, the ceramic

sample recovered in the *Lavras do Abade* site was characterized by a lower value for the individual and utilitarian artifacts than for the shared pieces.

When the scale value of the ceramic sample was compared with the average date for the objects, a consumer pattern emerged,¹⁰ indicating an investment in vessels mostly associated with social and sporadic representations. In this way, the ceramic acquisition in the administration house represents a preoccupation with collective participation over individual distinction. In the same way, it is interesting to think that in the house of the mine owner, the place where the social distinction was probably fiercer, the artifacts with maximum expressions of value in the *Abade's* society were directed from the personal domain to the public sphere (Figure 4-2).

The South mean date formula was also used in the glass bottles vestiges of *Lavras do Abade*. However, the selected proprieties of the fragments were restricted to the mold manufacture marks, while other elements needed to establish narrow chronological attributes were not present in the sample. Mostly bottle body fragments compounded the utilitarian glass artifacts in the site. The date established for the selection of bottom-hinged and three-part molds, both nineteenth century technologies, was 1850.

$$1850 = \frac{\sum \frac{1880}{1810} 1845x8 \quad 16650}{\sum_1^8 9}$$

The average date of 1850 for these bottle fragments was not an exception, as glass bottles technology, unlike ceramic technology, did not regularly change in the nineteenth century. As Firebaugh (1983) alerts, it is necessary to be sensitive with chronological indicators that include closure technology and changes in the color process. In this way, the majority of purple fragments in the glass artifacts also can suggest an average date of 1867, placing the sample of the site in the third quarter of nineteenth century. Consequently, the average date between 1850 and 1867 attributed to the glass utilitarian artifacts in the *Lavras do Abade* site corresponds to the period of production of these artifacts. Therefore, it is necessary to extend the date of use beyond the period of production, due to the excessive recycling activity of glass containers.

¹⁰ See Majewski and O'Brien (1987:175-187)

Baughner-Perlin (1988) maintains that glass bottles manufacturing in the nineteenth century was a uniform process, with shapes that permitted recognition as medicine bottle, wine bottle, or otherwise. Through the exploration of the principles of Miller's ceramic index value, it is possible to establish an economic and social "value" for these imported artifacts. Brazilian production of glass bottles, however, only began in the twentieth century. The glass bottles were classified as being either for medicinal, hygiene, or beverage, and interpreted according to their fragment quantities. The massive concentration of patent medicine bottles¹¹ would indicate, in addition to a preoccupation with health, a significant financial expense in the acquisition of these artifacts (Figure 4-3).

On the other hand, the massive quantity of window glass in the manager's house and store, also can serve as a chronological indicator (Day, 2001; Rivers, 1999), and be interpreted as a status element. First, because the majority of flat glass fragments with measurement of 2mm in the site affirm the dates of the site between 1835 and 1881. Second, because the large quantity of window glass also could be a result of the wealth patterns in the *Lavras do Abade* village, and it was probably used as one more social element (as the "gold" roof tiles) to distinguish buildings status inside the village.

The metal sample of the *Lavras do Abade* site serves as a limited example of an expressive universe significantly distinct from the construction elements. The age of the sample was represented by the two square cut nails from the first quarter of the nineteenth century, and one sample of square rose head nail dated from between the 1600's to the 1800's. These dates are typical for the time expected for this type of material category, which is a strong recycled category in the majority of historical archaeological sites, as well as the fact that metal is generally a difficult element to date.

The state of corrosion¹² was more present in the square nails (cut nails) than in the rose head nail or the wire nails of the sample. The different state of corrosion of the square nails could be associated with the type of metal or the poor iron matrix of this type of nail, or even the soil conditions in which the object was deposited, besides the age. However, it is also

¹¹ "Patent medicine has become the common, generic term applied erroneously to all remedial agents old without prescription (Muney, 1970)" (Fike, 1987:3)

¹² "It is now understood that the simple general corrosion formula is actually two processes. Corrosion or oxidation is the movement of electrons both within and between metals and the freeing of metallic ions (charged particles of metal) while reduction is the collection of electrons. All corroding metals create a battery with a positive pole and a negative pole" (Rodgers, 2004:75).

necessary to note that the village had a smithy, and more research needs to be carried out concerning this (Figure 4-4).

Similarities and Differences in Historical Archaeological Sites

In the contemporary world, historical archaeology works as an instrument to reveal more than just material culture, or its vestiges, but also as a research program that tries to give meaning to 500 years of social, political and economic constructions of a new system. Therefore, the artifacts can be considered more than historic documents. They have intrinsic properties and extrinsic attributes that in combination produce logic about past societies.¹³ Artifacts may also be studies of commodities.¹⁴ In this case the object serves to connect the manufacturer to the consumer, and eventually the trader, which transform the objects in “value”.¹⁵

In comparison with other archeological vestiges recovered from present-day *Pirenópolis* city to the same nineteenth century period,¹⁶ the *Lavras do Abade* material culture presents some similarities and differences. The first apparent similarity lies in the glass samples that appear in both deposits with expressive occurrence of medicinal bottles in the two sites, which could perhaps be connected with the practice of Hippocratic medicine¹⁷ during the period (H. B. Carvalho & Lima, 2003:29). However, the massive occurrence of medicinal bottles in the *Lavras do Abade* is an exception, given that historical archaeological sites identified as mining sites are more characterized by the accumulation of alcohol beverage bottles (Baxter & Allen, 2005:72). Another false similarity between the two archeological samples is the concentration of metal vestiges in the classified construction categories. The preservation of metal artifacts as construction elements, however, is not

¹³ To complete discussion see: (Gardin, 1979)

¹⁴ “In objectification, humans transform objects of nature thought in social labor to create material culture” (McGuire, 2002:103).

¹⁵ The object “value” can be dividing in three types: value of use, value of exchange and aesthetic value. The use value corresponds to the functionality for which an object was made, the exchange value is the commercial value that is dependent of market, and in third or no less important we have the aesthetic value, that is not necessarily equal to the others use and exchange value, but ideal (Orser & Fagan, 1995:83-93).

¹⁶ Project of salvage archaeology conducted in the historic center of *Pirenópolis* during 2002 and 2003.

¹⁷ It is based in the “humor theory” applied by Hippocrates (460 B.C. – 370 B.C.) that establishes the necessity of balance the four body fluids (blood, black bile, yellow bile and phlegm) to cure any illness.

exclusive to these sites. On the contrary, it is the most common category of metal artifacts in most historical archaeological sites.

Nevertheless, the first real difference concerns the ceramic artifacts from *Lavras do Abade* and *Meia Ponte* villages, which were characterized for the most part as pieces of expensive value and collective use, contrasted with pieces of cheap value and individual use. The ceramic sample recovered from the old *Meia Ponte* village was characterized by the low incidence of more valuable items, such as porcelain, and by massive presence of simples earthenware without decoration and characterized by small concave fragments from individual bowls (H. B. Carvalho & Lima, 2003; D. Curado, 2009). The ceramic artifacts are one of the best indicators of economic status in historical societies. In this way, the expressive difference between these specific categories of material culture in both sites is also a good social indicator of disparity. Specifically in the case of *Lavras do Abade* sample, the preoccupation with the communal and ostentation is intimately related to the historical information of public display, but also could be related to gender influence.¹⁸

In the same fashion, the other two building construction elements are also associated with the economic and social similarities and differences established between the *Lavras do Abade* and *Meia Ponte* villages, like the glass windows and roof tiles. The glass windows are an important element of wealth measurement in the interior villages of nineteenth century Brazil. The substantial presence of this vestige in the *Lavras do Abade* sample is an indicator of high concerns with the quality of buildings. On the other side, the roof tiles used in the Alfredo Arena's house are unique in the entire sample studied. The presence of "golden" roof tiles in the administration house is a remarkable indicator of economic and social distinction, inside and probably outside the mining village (Figure 4-5). In similar ways, but different execution, the old *Meia Ponte* residents are also concerned with the ostentation of their houses, however, more than constructive materials, the main preoccupation to them was about the location inside the village (D. Curado, 2009:73-4).

Otherwise, the main difference between the two investigated archeological deposits occurs because of the complete absence of pottery samples from the *Lavras do Abade* site and the expressive presence of pottery samples in the old *Meia Ponte* village excavations areas. It is generally affirmed that African related pottery is a common occurrence in the mining sites from the Brazilian Middle West (H. B. Carvalho & Lima, 2003:20). However,

¹⁸ "By the late nineteenth century, women were the primary purchasers of household goods, a fact that has not received the attention it deserves in research on consumer behavior and the consumerization process" (Majewski & Schiffer, 2006:44).

the *Lavras do Abade* site presents an intriguing counterpoint, which needs be further explored in future research. The total absence of pottery in the studied sample could be a reflection of the collection methodology, or also could reflect the different social constitutions in the interior of the mining village.

Historical archeological sites are unique places with defined time and space. However, it is necessary to distinguish between space and spatiality, where space is the physical reality and spatiality is a conscious creation of space. Archeological sites are places that have vestiges of human presence, such as objects, structures or modified landscapes. According to Lefebvre (in: Orser, 1996), the capitalist space has three important functions: as means of production, object of consumption, and political instrument. However, we need to keep in mind that there are material limits to our knowledge and not all of the past can be archaeologically perceived.¹⁹

In conclusion, the similarities and differences between the material culture vestiges from both *Lavras do Abade* and *Pirenópolis* (old *Meia Ponte*) sites, demonstrated significant economic and also social disparities. The glass, metal, ceramic, and pottery are undeniable, physical indicators of economic and social status, and their substantiality is what characterizes the historical archaeology. However, the political aspects of this materiality are issues that need to be better explored, through other sources of data such as oral history and memories about it.

¹⁹ To complete discussion see: (Gallay, 1986)

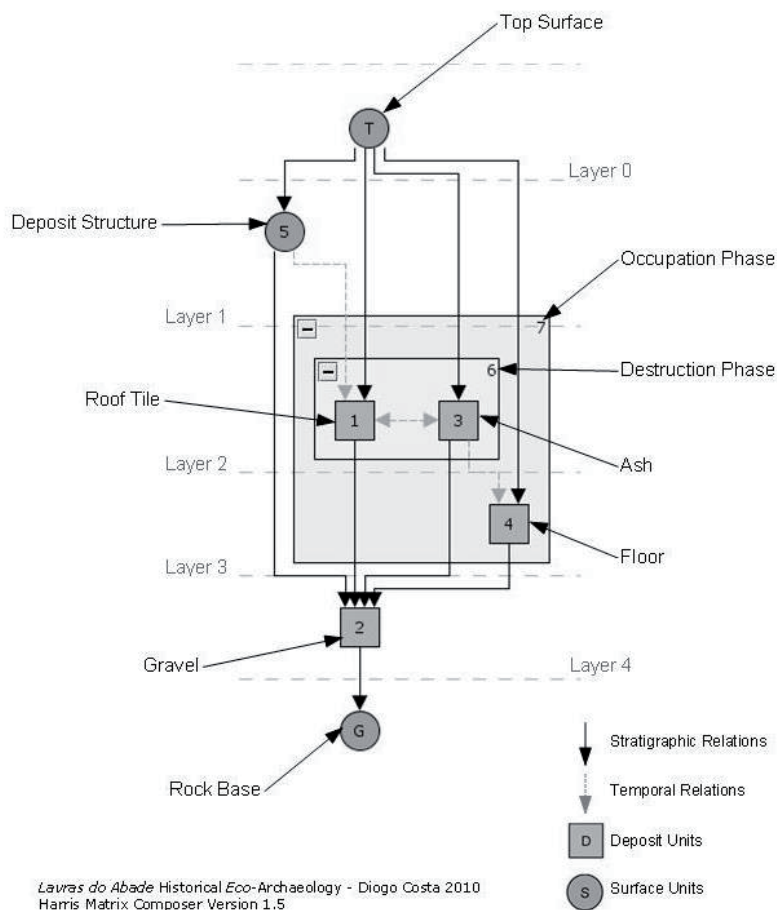


Figure 4-1. Harris Matrix of *Lavras do Abade* site – (no scale).

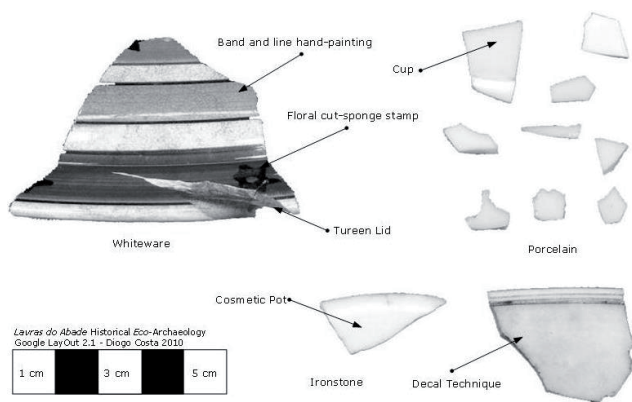


Figure 4-2. Ceramic board.

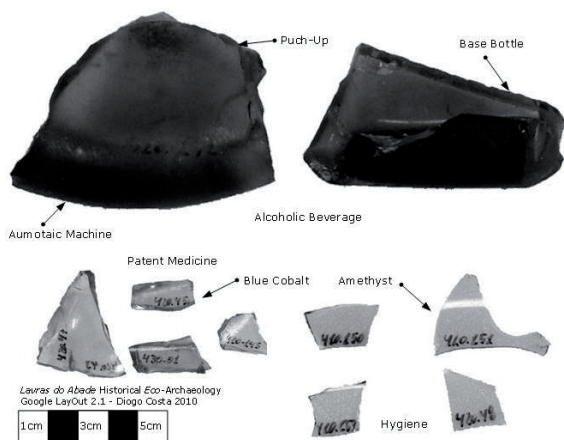


Figure 4-3. Glass bottle board.



Figure 4-4. Metal board.

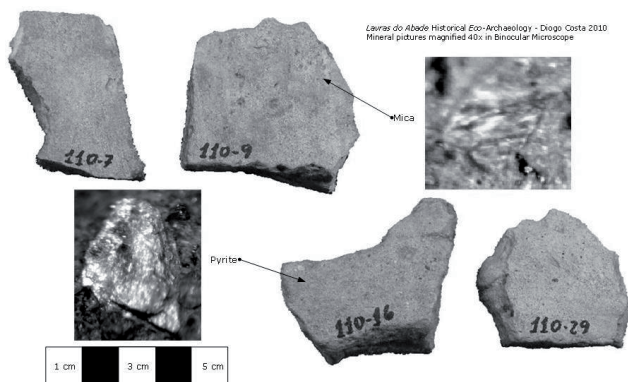


Figure 4-5. Roof tiles board.

CHAPTER 5

MEMORY OF THE *MEIA PONTE* COMMUNITY

Collective, Cultural and Social Memory

Memory, whether individual or communal, is a human phenomenon that varies according to circumstances in different landscapes and epochs. Here, I intend to look for regularities or patterns in the current and past memories of *Pirenópolis* citizens about the *Lavras do Abade* conflict. The remembrance associated with this archeological site is understood as an individual and communal construct, and the forgetting process attached to this is sometimes the result of cumulative actions, either conscious or unconscious. To summarize, the *Lavras do Abade* historical, archaeological site is one 'lost island' in the collective, cultural and social memory of a group, which retrieves according to present interests and maintains by past silence.

Mechanisms of Time

Why do societies remember? According to Zerubavel (2003), the society's act of remembrance is an intrinsic consequence of mechanisms used to measure time. For Zerubavel, two principles of the "time line" are used to order the events in the past, present and future: one is the "progress" and another is the "decline." The progress "time line" is the usual perception of time in a straight, linear segment that departs from a "primitive" or "rag" point, and goes through a continuous and uninterrupted "improvement" or "development," ultimately reaching the "riches" or "civilized" society. Commonly, this perception is better represented in the notion of "evolution" largely propagated in Western societies, where the notion of "simple" past is essential and corroborates the execution of this mechanism.

On the other hand, the "decline" mechanism follows the same structure, although in the reverse direction. Here, the social "time line" starts in an "ideal" or "good old days" notion, and is thought to follow a "descent" trajectory before arriving at the present-day. In this mechanism, the past has the most important function, as it is the only system of measurement to the present-day condition, and is thus responsible for another inherent subsystem that occurs in this type of time mechanism: nostalgia.

Therefore, for Zerubavel (2003), these two mechanisms do not work in isolation of one another in society, but in accordance with one another. For the author, the real mechanism that happens in the society's acts of remembrance is a "zigzag time line", which

is best observed in the historical movement of societies, and not in their ideological projections of “future” or “past.” According to Zerubavel, the fall-and-rise system is a combination of both progress and decline systems, but both are essentially involved in a strictly unilinear perspective.

However, modifications at the end of the nineteenth century altered the unilinear perspective, which was a consequence of the evolution view, with the development of biological researches, ironically, modifying its “ladder” narrative. The discovery of different evolutionary sequences, such as the extinct *Homo Neanderthalensis*, results in the construction of “tree” narrative forms that transform the historical plotline into a conception of multilinear mechanisms. Therefore, not all societies have this “forward” notion of events, and the circular idea of time still perpetuates, though not to suggest that the combination of linear and rhythm time forms cannot be applied. The combination occurs, effectively, in different levels, when the year is measured in a linear dimension, and the levels of months, weeks and days are measured in the circular vision, for instance.

Nevertheless, one point is common to all these systems of narratives, or society’s acts of remembrance: the importance of the past in explaining the present condition. As noted in his work about the “sociomnemonic” density of American history, Zerubavel (2003) observes two basic modes of envisioning time: the legato and the staccato. Despite differences in the structure of accumulation of data, these general historic visions represent the same particular mnemonic action: the perpetuation of the present.

Psychology and Philosophy of Memory

According to Wilkes (1997), memory is in part an accumulative process, and has been seen by scholars as an archive from which specific items can be retrieved in the process of remembering. However, it had long been recognized that the human memory does not behave like the hard disk of a computer; it is not always accurate and reliable. Human memory can fail completely or it can be influenced by a variety of different factors, thus altering the past.

According to Baddeley (1989), the memory is much better considered as alliances of several different subsystems, all of which have in common the capacity to take information, store it, and subsequently make it available. The author initially divides memory into three broad categories: the sensory memory, the working memory and the long-term memory. The sensory memory is the mechanism responsible for the collection of information from the exterior world, composed mainly by iconic memory (visual) and echoic memory (auditory).

The working memory mechanism is an attention coordinating system known as the Central Executive, and aided by a number of subsidiary slave systems, namely Visuo-spatial Sketchpad and Articulatory Loop. Finally, the long-term memory is the memory “archive”, and on this topic, I will briefly devise explanations about how it is composed and how it works.

The long-term memory is composed of the personal memory, the cognitive memory, and the habit memory. The personal memory concerns a conscious recollection of personally experienced events, which figures significantly into our self-descriptions, and is also called episodic memory. The cognitive memory concerns knowledge of the world, and is also called semantic or categorical memory, which is made up from multiple episodic memories. Finally, the habit memory is our capacity to reproduce performances, such as riding a bicycle. Habit memory is also known as declarative and procedural learning systems.

In this way, the memory is a mechanism of knowledge catch and learning execution, but does not work in a total, sequential system. According to Wilkes (1997), the accumulative memory works in two senses: the knowledge accumulation, that is a purely accretive exercise, where discrete “headed records” are formed, which are independent of each other; and on the other hand, the “dynamic memory” that proposes that memory updating occurs constantly as new inputs trigger reminders to parallel events that have occurred in the past.

To Baddeley (1989), however, the mechanisms of storing information are fallible at each of these points, and the principal elements that ignite these fallible actions are the confabulation, bias or emotion and repression. The confabulation is an association of impaired or clouded autobiographical memory and a deficit on the central executive of working memory that is necessary for controlling and evaluating behavior. It is then clear that bias and emotion can both cause distortion in what is obtained as memory.

Finally, for both authors, there is no doubt that the human memory is eminently fallible. However, this fallibility of memory is a reflection of the biased feeding of information into memory systems and the consequential scheme of this selection. Therefore, if the individual memory is considered “psychologically” fragmentary and inconstant, a philosophical question arises: in the individual memory exercise, how many are the “real” memories and how much is the “creation” of the contemporaneous mind?

Paul Ricoeur (2004) suggests that the problem posed by the entanglement of memory and imagination is as old as Western philosophy. According to Ricoeur, the Socratic philosophy left two rival and complementary approaches on this subject, one Platonic, the other of Aristotelian vision. The Platonic vision is centered on the theme of the *eikon*, which

is the present representation of an absent thing. Memory is in this way implicitly closed to the problematic of imagination, or used as the “tool box” to creation of the ideal world. On the other hand, the Aristotelian vision centered on the theme of the representation of a thing formerly perceived, acquired, or learned. The memory, in this second case, includes the problematic of the image, or the representation of the real world.

To expand on Ricoeur (2004), thoughts do not exist as an intermediate level between individual and collective memory. Consequently, if the remembrance act has a portion of creation or representation of individuals, this occurs not in isolation, but by influence of a determined group or society. What occurs is a difference of distance between the public and private relations, between the self and others. In this way, the “shared memory” is an individual sense that varies to the close contemporaneity of “growing old together,” and in the threefold attribution: to oneself, to one’s closed relations, and to others.

What is Collective Memory?

Similar to Paul Ricoeur, Maurice Halbwachs agrees that the idea of an individual memory, absolutely separate from social memory, is an abstraction almost devoid of meaning. For Halbwachs (1992), groups provide individuals with frameworks within which their memories are localized, by a kind of mapping into both the mental and material spaces of the society. According to the author, the memory is a social construction with the function of perpetuating the present-day, with the valorization of some select aspects of the past. For Halbwachs, the individual memory is not more than a cog in a big machine; or in the best functionalist’s words of Emile Durkheim, an instrument of a social “organic” solidarity. On the other hand, previous to Levi-Strauss and in a “structuralist” insight about the collective memory, Halbwachs also admits that beside the individual agency, the memory is organized by an extra social framework.

To Halbwachs (1992), the memory is a recollection of contemporaneous facts, but with a reminiscence of disoriented and mixed remembrances that do not follow a particular order or any logical construction. To corroborate with this thesis, the author begins with an explanation about the dreams, and how these “mental manifestations” are not, as many scholars propose, an unconscious element of memory. Halbwachs establishes that dreams are accumulations of memories, insisting that they do not follow any order or sense. Because the dreams are composed of fragments of memory, which are too mutilated and at the same time mixed up with other memories, we are unable to recognize the place and epoch. The author

affirms that when we are sleeping, the consciousness never completes a scene of events that occurred in the past. For the author, the disorder of dreams is the affirmation that the memory is a conscious and social oriented act, or maybe as his contemporaneous Durkheim views it as a “Social Fact.”

To Halbwachs (1992), though, outside of dreams, the past is not preserved but is reconstructed on the basis of the present. In this case, memories are disposed into two “mental systems”: one is the dreams that are in an alienated and disordered form, and the other is the memory that has a conscious and oriented disposition. Halbwachs appoints that the dreams cannot evoke the recollection of events of complex pictures, revealing the existence of frameworks of collective memory, on which individual memory relies. Consequently, it is with this “external” structure, that is a little Levi-Straussian, that memories acquire and result in social and contemporaneous signification.

According to Halbwachs, the dream is based only upon itself, while the memory depends on those of all our fellows, and on the great frameworks of the memory of society. As a result, and in explanation of the above statement, one question can be asked: Why is it necessary to include old references of the past in present-day memory?

For Halbwachs (1992), the explanation is one: the memory is a tool for social communication. Halbwachs explains that the individual remembers by placing himself in the perspective of the group, while at the same time the memory of the group realizes and manifests itself inside the individual memories. Therefore, it is only in society that the individual gives sense to these collections of mental figures. Because it is in society that people normally acquire their memories, and it is also in society that they recall, recognize, and localize them. This interplay of recognition is, for Halbwachs, a complementation of individual experiences and mainly a social construction. When people remember, it is others who prompt the memories, coming to the aid of one another and vice-versa. As a better manifestation of this complementary interplay of individual memories, we can identify the family experience as the first step to construction of a collective memory.

Therefore, how do these constructions occur? For Halbwachs (1992), the key mechanism to collective memory interaction is the framework. According to the author, collective framework is the instrument used by the collective memory to reconstruct the image of the past, which is in accord with the predominant thoughts of the society. However, besides this mechanism that functioned in a strict sense from individual to collective, it is not what I can call today a Giddensian term of “agency.” To Halbwachs, the collective framework is the combination of individual recollections of many members of the same

society. On the other hand, the author recognizes memory as a conscious organization of recollections, displaying a dual game in society and individually. According to Halbwachs, the collective memory, as a conscious and social act, is also an intentional and ideological performance. To Halbwachs, the various groups that compose society are capable at every moment of reconstructing their past, but at the same time they most frequently distort that past, in the act of reconstructing it. The alterations in this case are inherent in the process of reconstruction and re-signification of past memories, and compound the social act of individual memory creation.

Consequently, as social, ideological constructions, these collective memories are intentionally in our present-day biased by their generators, because social beliefs of whatever origin, have a double character. According to Halbwachs (1992), social beliefs are collective traditions or recollections, but they are also ideas or conventions that result from a knowledge of the present. This work results in an action of “conformation” of the past, when the memory is manipulated according to present orientations.

Therefore Holtorf (2000-2007) maintains that scholars in the humanities have argued that memory of the past is not only “influenced,” but “constituted” by social contexts of the present-day. As a result, the memory becomes fruitless, as does the discussion of whether or not a particular event or process remembered corresponds to the actual past. Consequently, what matters are the specific conditions under which such memory is constructed, as well as the personal and social implications of those memories. According to Holtorf, the distinction between individual and collective memory is not necessarily a sharp one. Both reflect, first and foremost, the conditions of the present-day in which they originate. Monuments, like other artifacts, lead people to create a past through active remembrances within the social context in which they live.

Holtorf (2000-2007) presents that Maurice Halbwachs thought to include the social arena, or the space which people always inhabit, when they remember. To Holtorf, the Halbwachian term 'collective memory' is about social processes that influence not only people's personal memories, but also a community's shared memories of the past. These collective memories are crucial for identity groups such as families, believers of a religion, or social classes. Following Halbwachs, Holtorf affirms that it remains possible to distill accurate memories of the past by removing the social layers of individual accounts, and bringing to light the originally archived item. However, is it possible to separate the individual from the collective memory? What is the difference between collective and

cultural memories? What are the interests involved in a “probable” construction of the past? And mainly, how is it possible to identify these constructions?

What is Cultural Memory?

According to Assmann (2006), the memory has two bases, one neural and the other social. The neural basis is the biological condition, which is impossible without the memory. The other basis is the social, so claimed by Halbwachs, in which the memory is developed through the interaction between people. For Assmann, the proposal of a cultural memory is a further step; since only then can we comprehend the vast depths of time.

According to Holtorf (2000-2007), Jan Assmann defines cultural memory as the "outer dimension of human memory," embracing two different concepts: "memory culture" (*Erinnerungskultur*) and "reference to the past" (*Vergangenheitsbezug*). Cultural memory is the way that one society ensures its cultural continuity by preserving the past with the help of cultural mnemonics. The collective knowledge from one generation to the next renders it possible for later generations to reconstruct their cultural identity. References to the past, on the other hand, reassure the members of a society of their collective identity and supply them with an awareness of their unity and singularity in time and space, by creating a shared past. These two concepts may or may not coincide.

For Assmann (2006), cultural memory is not about giving testimony of past events, as accurately and truthful as possible, nor is it necessarily about ensuring cultural continuity; it is about making meaningful statements about the past in a given cultural context of the present-day. The concept of cultural memory thus corresponds to studies of other forms of memory in society, which have shown how even personal recollections by individuals, concerning the (fairly recent) past of their own lifetime, do not support the view that memory is a simple storage place for information which can be retrieved later on, but suggest that, in memory, the past is actively constructed depending upon certain social and mental conditions, or what he calls the memory discourse.

Assmann (1997) defines discourse much more specifically than as a hermeneutic point of view. The author proposes that discourse is a concatenation of texts based upon each other that treats or negotiates a common subject matter. Assmann concludes that discourse is a kind of textual conversation or debate that may extend over generations, centuries, or even millennia. Additionally, this discourse depends on institutionalizations of permanence such as writing, canonization, educational, clerical institutions, and so forth.

For Assmann (2006), the cultural memory is the collective memory or communicative memory in the depths of time. The nature of this research has been illuminated by the oral history, demonstrating that the communicative memory has a general limit of one hundred years; it is the “horizon of living” for the memory. However the position of cultural memory is different, as this memory is learned, taught, researched, interpreted, and practiced. In this way, Assmann maintains that cultural memory differs from the concept of collective memory proposed by Halbwachs, and social memory in general, because time is the principal component.

Assmann (1995) explains that the cultural memory is characterized by the distance of the present, a principle suggesting that societies create ‘islands of time,’ or points of history suspended from the epoch. For clarification, Assmann characterizes the cultural memory into six points. First is ‘the concretion of identity,’ where the stored knowledge of one group is retrieved in a positive or negative sense from the foreign groups. Second is ‘the capacity to reconstruct’ that is not based in memory, but in frames of reference that are in potential historical archives as texts, images and rules of conduct. Third is ‘formation’ or crystallization of communicated meaning in collective shared knowledge. Fourth is ‘organization’ or formalization of knowledge in ceremony by specialized members of the group. Fifth is ‘obligation’ or constitution of a clear system of values and varying degrees of importance, which serves to structure the cultural supply of knowledge and the symbols.

Finally, the cultural memory is ‘reflexive’, and in three ways: as practice-reflexive through rituals, proverbs, maxims, etc; as self-reflexive in the analytical sense; and reflexive as a projection of its own social system. In summary, the collective and social memory is a memory in the “present,” while the cultural memory is the memory in the “past.” As archaeologists who live in the cultural memory of time, we need to be alert to these two aspects, and we need to try to recover the changes of memory throughout time. On the other hand, the study of cultural memory implies too, the study of different knowledge, each one in a specific period of existence, and more according to proposed by Richard Miller: “It sounds strange to say, but cultural memory also looks forward” (in: Williams, 2007).

What is Social Memory?

Therefore, if in one way the memory is a concession of individual particularities to society, in another way it is also a social construction of individual partialities. At this intersection, the individual is both a member and generator of distinguished groups, such as

the family, the community, or the work place. Consequently, the individual memory serves as both the product and support for the social memory. The individual memory constructs several interactions in different forms and levels, all the time, with many groups in society. In this way, for Fentress and Wickham (1992) the past has a particular meaning for each particular group, and the social identities are constructed through one or another version of the past. According to Fentress and Wickham, the social memory is the result of the interests of determined groups during the construction of a common past, while the collective memory is the act of agreement between individuals in this process of remembrance.

For Gross, (2000) the “collective mind” of the nineteenth century is nonetheless that of the social schemata of historical past, and these schemata are both general and group-specific. Furthermore, Gross argues that different groups tend to foster the mental structures most suitable to their purposes. These social schemata become internalized in the individual’s psyche. This last process exposes to the difficulty in distinguishing the strictly personal or private memories from social or collective memories, a process that also works in forgetting. Fentress and Wickham (1992) alert that the sorts of memories that one shares with others are those which are relevant to them. The context of a social group could vary from a structured and lasting group to an informal and possibly temporary one. Fentress and Wickham agree with Halbwachs that social groups construct their own images of the world by establishing an approved version of the past, and that these versions of the past are established by communication, not by private remembrance.

On the other hand, according to Gross (2000), when something is retained over time there is usually a good reason for it, because the retention is not accidental, but purposeful, intentional, and institutionally supported. According to Gross, there are three ways in which society, through its dominant institutions, involves itself in issues of memory. First, the society plays a powerful role in determining which values, facts, or historical events are worth being recalled and which are not. Second, the society has a hand in shaping how information from the past is to be recalled. Finally, the society has a say in deciding the degree of emotional intensity to be attached to memories. For Gross, the theories of social memory that assume the presence of some unseen collective mind are failures, because they are neither a Durkheimian “conscience collective” or a Jungian “group unconscious.” To Gross, the preservation of social memories and its maintenance over a long period of time occurs because particular traditions or particular institutional carriers have made it possible – not because there is some alleged psyche at work recalling by its own agency what individuals would otherwise forget.

Nevertheless, to Fentress and Wickham (1992) the history of social memory is also the history of its transmission, and can be measured by its systems of diffusion. The transmission and dispersion of the images and stories of social memories are no less than a form of commerce: subjects to changes and substitutions according to new demands. For Fentress and Wickham, memories die every day, but only to be replaced by other memories in equal or superior value. However, this does mean that the societies must accept social memory passively and uncritically. These are constantly tested, dialogued, and examined in its arguments over time.

According to Peter Burke(1989), history and memory share the same origin: both are product of social groups. For Burke, history is not an unbiased act, but the accumulation of individual memories that serves numerous “media” to transmit the social memory. In this way, history uses several historic “schemata” to reproduce and perpetuate the social memory. There are, according to Burke, five types of memory transmission: oral traditions; written records; images - still or moving; rituals actions, and space. The oral traditions were responsible for many transformations in the history discipline since the 1960’s. The written records are not innocent acts of memory, but are accumulates of persuasion. The images, whether still or moving, expressed and shaped the social memories, too. The rituals actions are reenactments of the past, but also are interpretations of the past. The space is a memory theatre, as Halbwachs defined.

In addition to the five types of historical transmission of social memory appointed by Burke (1989), one sixth element is notable in the work of Paul Connerton (1989): the body. According to Connerton, the re-enactments of the past depend upon their rhetorical persuasiveness, and prescribed and deliberately bodily behavior. For Connerton, the bodies stylistically re-enact an image of the past, because of their continuing ability to perform certain skilled actions. In consequence, many forms of habitual skilled remembering are illustrative actions that intend to keep the past in the mind, without knowing of its historical origin. Connerton concludes that in habitual memory, the past is, as it were, cemented in the body.

However, in other statements, the author insists that historical reconstruction is not conditioned to social memory, and it is possible for the historian to rediscover what had been intentionally forgotten. For Connerton (1989), it is necessary to distinguish social memory from a more specific practice as historical reconstruction. For the author, the history is separate from social memory and subject to a more unbiased investigation. Connerton explains that the historians can distinguish the historical reconstruction by critical

examination of statements contained in their written sources. On the other hand, the author also appoints the unwritten sources, for example the archaeological vestiges. Nevertheless, in these connections between historical reconstruction and social memory, one question arises: what is the physical dimension of social memory?

The Lost Island in the *Pireneus* Mountains

During the period of August 4 – 8, 2008, a series of interviews with the oldest residents in the town were conducted in *Pirenópolis* city. From the nine possible informants identified by the researcher, only five of the *Meia Ponte* descents were effectively interviewed, and the interpretations of these encounters are described below.

Therefore, before delving into the narratives, it is necessary to clarify the types of oral data that will be presented, distinguishing between oral history and oral traditions. The oral history is the statement related to an event in which the informant personally participated, as either protagonist or as spectator. On the other hand, the oral tradition is the story or history perpetuated through generations, the type of information through which the informant had access, only through his cultural memory. It is clear that in the case of the *Lavras do Abade* conflict, the speeches are all construed by oral traditions, but at same time, the oral history is also present through their own opinions and values' judgment.

The other point that needs to be primarily explained concerns the methodology adopted during the interview. The researcher chose to conduct ethnographic interviews, but with some directions through determined questions about the subject.¹ The first reason for this type of interview was because the emotional attachment of the issue, where it is necessary to give to the interviewed, the maximum space to expose his opinion, without constrains. Secondly, the methodology applied was appropriate given the age of the informants. When interviewing individuals of considerable age, it is necessary to consider failures in the memory, precipitated fatigue, and to expect constant switches between subjects.

The Practical Alchemist

The first interview was conducted with Mr. Ilno Pompeu de Pina, a 75 year old dentist, who conducts his profession in the old family office at downtown of *Pirenópolis*. Mr.

¹ “Unstructured interviews are based on a clear plan that you keep constantly in mind, but are also characterized by a minimum of control over people's responses”(Bernard, 2002:205).

Ilno is an eighth generation dentist in the family, and extended great humor and much energy towards me during the interview. My introduction was quick and concentrated in presenting the objective of my research and explaining the process used to collect the data. Mr. Ilno listened to everything from behind his black plank table, the same table that he uses to prescribe treatments and to give attention to his patients. Initially Mr. Ilno agrees with the interview, but explains to me that he does not know much about the *Lavras do Abade* conflict, as his contact with the subject was through his father and the stories that others recounted. Mr. Ilno poses questions about the general ore process extraction, and explains the importance of extracting a specific ore called *Rutiro*, or titanium. According to Mr. Ilno, the gold is heavier when taken from alluvial creeks, and stays at the bottom of the big plate, normally used in this process, with the gravel from the river on top and the titanium in the middle. After the collection, the gold is place in the *carumbé* - a big deep bowl to wash precious stones like diamonds, and different from the *batea*, which is a more rounded plate, to wash the gravel when looking for gold.²

With many descriptions about the quality of the gold found in the area, Mr Ilno affirms that in the region of the *Lavras do Abade* the gold always appears with iron fragments, because this region has much iron and other metals. Furthermore, he starts to describe the process which he used to refine the gold, using a ceramic plate and glass instruments. The gold is used by Mr. Ilno in the reconstruction of teeth, as well as in some little jewelry confections that were later presented to me. Mr. Ilno confessed that a long time ago he had a glass bottle with gold samples from each region of his locality, but that each extraction was identified by the name of the miner, and not by the name of the place where they were collected.

Mr. Ilno's first statement demonstrated a close relationship with the gold extraction, and it is possible to draw parallels between his specialized profession as the dentist in the small town of *Pirenópolis* and with the specific practice of a jeweler in a mining town in past times. This assumption is confirmed when Mr. Ilno explains that in diverse times he also combined the gold with silver, to produce what is called with-gold. Mr. Ilno demonstrated a huge knowledge about metals, explaining that a combination of gold and silver provides a more plastic propriety, while the substitution by copper gives a redder aspect. It is obvious

² To more specific gold extraction techniques see: Mining Techniques and Gold Exploitation in the sixth chapter.

that this knowledge goes beyond that of the practical activity of a dentist, but it is probably sustained by generations of empirical physicists and chemists in the family.

Related to the *Lavras do Abade* conflict, the informant explains that the principal problem was raised by the use of mercury, in the extraction process of gold from the ore. According to Mr. Ilno, mercury was used indiscriminately in the area because historically, mercury was presumed to have the power of attracting gold. On the other hand, the dentist reveals that the mercury does not attract gold, but provokes a serious illness in the people who breathe mercury acid after its evaporation in the foundry house. Mr. Ilno comments on the necessity of using protective equipment when engaging in this activity, and demonstrates that he uses a mask to protect himself from acid exposition.

To explain the problems of mercury pollution in the environment, the practical alchemist gives me a lesson on the mercury transit in the river and its transformation to poison. According to Mr. Ilno, the combination of mercury with water of the river generates mercury oxide, which is a very dangerous poison. The indiscriminate dump of mercury in the *Almas* river was the principal motive to the people's fight, because the mercury concentration in the water had killed all the fish. At this moment during our interview, I believe that Mr. Ilno makes an environmentalist manifest and equates the *Lavras do Abade* conflict with the contemporaneous ecological discourse. However, his affirmations are repeated with the reinforcing statement that: the use of mercury by the old people in the *Lavras do Abade* village was based in thinking that the mercury serves to attract the gold. To complete his opinion, Mr. Ilno also explains that the mercury was introduced in the region from abroad and that all the waste from the mine village, was dumped into the river.

The vehement affirmation that the mercury pollution served as the principal motive for the fight between the *Lavras do Abade* village and the *Meia Ponte* village is not new; but this subject is also not totally proven in the historical documents.³ In a collective memory process, the mercury is a representation of a contemporaneous environmentalist discourse, which resumed with Mr. Ilno's phrase: I buy much mercury, but I do not purify the gold with this. Finally, Mr. Ilno reveals his perception about the assault from *Meia Ponte* to the mine. He explains that it was a very ugly fight that pitted everyone against *Lavras do Abade*; the assailants' group was not formed only by the common people but by all of society: storekeepers, doctors, farmers, etc., who together demolished everything in the place. Mr.

³ To review the *Lavras do Abade* conflict, see: History of a Conflict in *Pireneus* Mountains in the third chapter.

Ilno explains: Because the water that supplies the city came from there, and the pollution stopped this.

Mr. Ilno's interview was a rich demonstration of practical knowledge in an exercise of constructing a shared memory, or collective memory. His observation about the mercury pollution validates the discourse of the environmentalist fight in the *Lavras do Abade*, but omits other motives that were observed in the "spaces" of the interview. As a male representative of a scholarly segment of society, he was strong in his affirmations. Therefore, more than an encyclopedic discourse about the chemical transformations of materials, the *Lavras do Abade* conflict is used as an example of revolutions that had occurred also in the *Meia Ponte* society during this time.

The Old Miner

The second interview was with Mr. Sebastião Profeta do Amaral, nicknamed Sebastião de Chica. He is a 92-year-old miner who lives in the periphery of *Pirenópolis*. At the end of Mr. Ilno's interview, he kindly identified Mr. Sebastião as his fellow and relative. The interview with Mr. Sebastião occurred in his house, an old wood construction with no more than two rooms. I was lead to the internal patio, where Mr. Sebastião was seated on a wooden piece, similar to a tree trunk, and I was placed in a fragile chair in front of him. Before beginning the interview, Mr. Sebastião makes it clear that everything that he proposes to speak of is his own knowledge, and that nothing will be created by what he does not know. After I have agreed, Mr. Sebastião starts to talk directly about the *Lavras do Abade* conflict, which according to him was discussed with him by others who lived there, probably by his Indigenous and African relative's ascendants.

Mr. Sebastião starts to explain that the story of *Lavras do Abade* did not begin when Alfredo Arena arrived in the area, but that the *Lavras do Abade* was an old gold mine from the old farm that were called *Cabaçeiros* or the fountain of *Almas* river. The first mining activity in this area of the *Pireneus* mountains was at the time when the explorer Josué de Campos discovered the *Goiás* state. Only after this did the *Abade* priests appear, and after whom the area was named. The *Abade* priests began to explore the gold in the place, and in order to do this, they contracted people from *Sítio do Campo*, probably a farm in the region. The people ordered by the *Abade* priests, were known by the name of "*Siqueira* Family", and according to an agreement with the priests, they could work in the alluvial gold from the mine, but not in the mine itself.

During this moment in the interview, Mr. Sebastião made a short pause and said: My ancestors were miners and these stories come to me from a long, long time ago. After this introduction, the old miner proceeds to tell me that the men who worked in the *Lavra* of the priests, or *Abades*, started robbing the gold of the prohibited mine, and challenged the priests to war with gunpowder explosions and shots and with shoutings in front of their house. Mr. Sebastião continues to say that in revenge, the priests put a spell on the people who challenged them. The spell ensured that until the fourth generation, the people will be cursed. During this moment, I believe that many associations of different individual memories are conducted by the old miner, because the narrative of these events before 1887 is closely related to the events that occurred in 1887. On the other hand, the presence of these priests in the *Pireneus* mountains is a case that needs to be further investigated; however, the historic documentation also revealed that Alfredo Arena was an active freemason.⁴

Later, Mr. Sebastião explains that between the *Lavras do Abade* village and the town of *Meia Ponte*, there is another mine, and that this mine was owned by another priest called Geraldo Barbosa. However, access to this mine no longer exists, because the road is closed. This old road to the *Pireneus* peak, he says, is also the old road that connected the *Goiás* state to the *Bahia* state, in the imperial government time. The landscape memory travels deeper when the informant says that the old road nearby the village, called “*Tapera Grande*”, is today known as *Cocalzinho de Goiás*. The old miner continues to say that the road is so old that troopers with horses and walking slaves were the first to use the road, before the oxcart or other wheeled transportation. Here, I have discovered another interesting contradiction: the old road that connected *Goiás* to the littoral was a recurrent citation in the *Goiás* historiography, but its end point in the period studied was in the *Vila Boa de Goiás* or the old province capital, and not in *Meia Ponte* or in today's *Pirenópolis*. Therefore, the *Tapera* village which is pointed out many times and quoted in the historical documents, is included as part of the *Lavras do Abade* area, or also as a point of support during the attack events.

Mr. Sebastião returns to the story of Josué de Campos. According to the informant, the man was without doubt the first miner in *Lavras do Abade*, and his mining work occupied him from the *Barragem* creek until the *Corumbá* river. To the old miner, he also built the *Bomfim* church of *Pirenópolis* in 1750, and in 1755, he brought a sculpture of *Senhor do Bomfim* from *Salvador*. It is interesting to note that the extension attributed to Josué de

⁴ Despite the freemasons not being a religious group but a fraternal organization, it is plausible to consider it as a belief.

Campos's mining activity in the *Pireneus* region is the same that was authorized to the CMG Company as the zone of exploitation in 1880.⁵ Therefore, Mr. Sebastião assures that after Josué de Campos, the *Lavras do Abade* land remained without an owner, and was used by opportunists, until around the 1800's, when Alfredo Arena arrived at the place.

Mr. Sebastião also explains that the gold in the *Lavras do Abade* was always collected with mercury, and that during that time, this element was called *azougue*, which is today classified as poison. Following this affirmation, he also queries me: But how much did I touch in this? I had mercury with me until today... It is obvious that was a joke, and despite the modern perception of mercury causing illness to the human body and environment, this product was (and remains) largely employed in the process of gold extraction around the whole country. However, to the son and nephew of miners, Arena in the middle of the 1800's had total imperial permission to start to work with mercury in the *Lavras do Abade*. Contrary to the first interview, I can now make an assumption that the use of mercury was not completely opposed by all the residents of *Meia Ponte*, and indeed that this product was sometimes associated with hard work and vitality.

Mr. Sebastião also records that in the *Lavras do Abade*, Alfredo Arena takes the black copper imperial money, or the 40 or 20 *Reis* coins and covers it with gold to imprint a stamp in the back of the coin of *Arena Garantido*. These coins were used to pay the employees of the mine, the same people who Mr. Sebastião had known as *jagunços*, or a type of "bodyguard" in the rural areas. The interviewee also explains that these *jagunços* are all dead, but that in the past they lived in the city until approximately the middle of the twentieth century. According to Mr. Sebastião, the mine was not returning the investment, creating a problem between Arena and the people of the city. In this way, Arena polluted the water as a form to provoke the attack and receive the compensation from the government. To the old miner, the people of *Meia Ponte* were always a bad people, and because of this, any type of disagreement had motive for a violent response. According to him, however, this has now changed since the people of the city are now mixed with foreigners.

Despite the biological ethnocentrism of the old miner, his claim that the assault was provoked by Alfredo Arena is corroborated by some indications in the historical documents and with the sequence of his explanations. Mr. Sebastião, at this moment, affirms that he knows the place where Arena controlled the clean water which reached the valley. In this

⁵ For a more complete history of *Lavras do Abade* see: History of *Lavras do Abade* 1750-1887 in the third chapter.

way, he controlled the water supply to *Meia Ponte*, giving residents the polluted water during a normal week, and conforming to the contract assigned by the legislative house on the weekend, by distributing clean water. However, Arena starts to bully the people of the city, and to limit the clean water during the weekend as well, and according to Mr. Sebastião: Who had not water, had nothing. When the people began to complain to him, Arena says: I want to see the people cut the water with a knife and eat it with a fork; a clear allusion by Arena to the level of the mud that the mine exploitation dispensed into the river.

Mr. Sebastião is convinced that the people in *Meia Ponte* village were not happy with the actions of Alfredo Arena, and put together eight bodyguards to attack the place. The informant does not agree with the people who say that the *Lavras do Abade* was a city; to him it was not a city, composed only by ten houses and one corral. Mr. Sebastião affirms that when the people broke into *Lavras do Abade*, Alfredo Arena was out of the mine; because he knew what would happen. He flees the village, leaving behind his wife Ms. Umbilina, which the interviewee remembers, “she cries her eyes out”.

In the end, Mr. Sebastião affirms that the people of the *Meia Ponte* did not rob *Lavras do Abade* after the assault, but that it was the people from abroad who robbed the area. During this moment, the informant made a short pause and concluded that: There was a store, (pause)...then that was a little village. Concluding, Mr. Sebastião asserts that the *Lavras do Abade* has many legends, but that Alfredo Arena was the individual responsible for cutting the water to the city, because the mine was not returning the investment. According to the old miner, everything that starts as a misdemeanor ended badly, and consequently Arena provoked the conflict to not end in injury with his mine investments. Mr. Sebastião ends the interview by showing me the instruments that he used during the years to excavate the *Lavras do Abade* site, looking for ore, or the *Rutiro* metal that during his time was more valuable than gold.⁶

The Handicapped Painter

The third interview took place with a retired painter named Pêrsio Forzani, who is 77 years old. As resident of *Pirenópolis*, Mr. Pêrsio is the son of a clothes maker that had served one of *Lavras do Abade* proprietors. Due to having impaired legs, the painter spent his entire life in his house, though he still had the opportunity to closely follow the events involving his

⁶ During the WWII the *Rutiro* was used in iron combination to create Titanium, the metal used in Germans tanks.

father and the city. Mr. Pêrsio welcomes me into his own house, which also serves as his studio. In a room with only one window, the painter creates his work with vibrant colors that represent the everyday life of a city that he knows so well. The interview was not so easy, as he is very busy with the community children that at all moments appear in the window to talk with him, or by the relatives who constantly appear to give him assistance and to ensure that everything is okay. Mr. Pêrsio is an enigmatic and magnetic figure, with a constant speech, but a relatively failed memory.

With regards to the *Lavras do Abade* conflict, Mr. Pêrsio says that Alfredo Arena had many workers, and that in the old times, it was common for a colonel to have cannons and a series of armaments to protect his property. Mr. Pêrsio argues that the conflict between the mine worker village and the *Meia Ponte* residents occurred mainly due to the fact that the gold was leaving the city limits, and the city hall had not received any profits from the exploitation in the *Pireneus* mountains. The painter explains that the *Lavras do Abade* miners did not pass by *Pirenópolis* to go to the mine from the outside of province; instead, they made a turn around the mountain and passed by the other city called *Corumbá de Goiás*. This route was taken to avoid the *Meia Ponte* population, and in this way, Mr. Pêrsio explains: When the people thinking that they are not working (in the *Lavras do Abade*), they are working.

Additionally, Mr. Pêrsio claims that as a result of these actions, the *Meia Ponte* residents convoked a group called “black masker”, who were responsible for damaging everything in the mine. Alfredo Arena was not there during the attack but was in *Rio de Janeiro*. Mr. Pêrsio reinforces that the group always declared that they broke everything because of the water pollution. However, the painter affirms that there was no way to pollute the water with the mine activity, because the water that supplies the *Almas* river runs from the other side of the *Pireneus* mountains and not from the *Lavras do Abade* mine. Therefore, given that all the historic documents make reference to the mud provoked by the mine, this activity is unquestionable. I believe that here, the painter made a bad localization of the real problem, as the *Almas* river is supplied by two creeks: the *Barriguda* and the *Inferno*. The *Inferno* creek comes from two other creeks: the *São José* and the *Santa Maria*, both of which originate in the *Pireneus* mountains, but neither of which pass by the area of the *Lavras do Abade* mine. The *Barriguda* creek, however, was responsible for draining all of the mud from the gold mine during its time of operation, and consequently for almost partially flooding the *Almas* river with mud.

However, Mr. Pêrsio insists in his statement that the vandalistic action of the black maskers in the *Lavras do Abade* occurred mainly because the mine neglected to pay royalties

to *Meia Ponte*. The painter completes his argument to tell me that the *Lavras do Abade* community had assembled from raw materials from his own money, doing everything to not use the money of the government, and that this money was called “*cunha*”. Mr. Pérsio remembers that the years following the *Lavras do Abade* conflict were very fragmented and sometimes confusing. The next two statements are equally dubious, such as the affirmation that the *Lavras do Abade* village had a press journal and a music band. It is not totally impossible that at some moment, the mine village had aspired to city life, but it is also historically registered that the journal and the music band were from *Meia Ponte* and not the *Abade* village during that period.⁷

At the end of the interview, Mr. Pérsio made a series of statements against the State, and the depreciation of the artist's class. The painter exposed the cultural production of the *Meia Ponte* village, mainly through the many religious compositions, to which the researcher was invited to listen. The final perception about the painter is that there is a beautiful subversive mind inside of a tortured body, which does not compromise the free spirit of an artist. Mr. Pérsio has a strong position about the *Lavras do Abade* conflict, and despite his intrinsic knowledge in relation to the administrative spheres of the old mine, the common sense opinion is present. In this way, a capitalist affirmation of the handicapped painter continues to echo until today: If you get the gold, you need to pay the tax.

The Colonel's Daughter

Ms. Ita Pereira is 86 years old and a descendent of a secular family of landowners. Her ancestors were owners of the major cotton plantation and slave workers of the area and her family has until today a centenary farm in the suburbs of *Pirenópolis* city. The encounter with Ms. Ita occurred in her house, located at the margin of the *Almas* river, in the middle of the old center of the *Pirenópolis* town. I was welcomed into the reception room, a vast commode with huge wooden pillars and with walls painted white. Ms. Ita was seated in a two seated couch and I was invited to sit down besides her. In front of her was an unfinished knitted tablecloth. During the first moments of the interview, the informant explained to me that all her stories concerning the *Lavras do Abade* conflict were from her father, and that she knew nothing directly.

⁷ For a more complete history of *Pirenópolis* see: History of *Meia Ponte* 1731-1880 in the third chapter.

Before my presentation, she agreed to talk about what she had heard as a child, as the employee who had followed me throughout the house left to prepare the coffee. According to Ms. Ita, the people that lived in the *Lavras do Abade* were guilty of the conflict among the villages, because they transformed the river to explore the gold, and as a result of the mining activity, the river became dirty. Consequently, the people in *Meia Ponte* no longer had a place to drink clean water or to take a bath. Ms. Ita pointed to the back side of her house, where the *Almas* river runs behind a vegetable and herb garden. Ms. Ita reveals that at a time, the people in *Meia Ponte* did not have water in pipes, and that the drinking water came from the *Almas* river that was turned to mud because of the *Lavras do Abade* gold. There is no doubt in her gesture, that to the collective memory, the water was and remains an important resource for the *Pirenópolis* community.

The colonel's daughter explains that the people in *Meia Ponte* village have been more and more revolting, and that they tried to talk with Alfredo Arena, but that he does not respond. As a result, the people of *Meia Ponte* called up the "courageous" of the city, with faces painted black with gunpowder, so no one knew who they were. The group of maskers rode horses and carried guns to carry out the destruction of the mine. Ms. Ita describes the destruction of everything in their path, including the intact house of Alfredo Arena, which had beautiful imported bowls and ceramics. Ms. Ita is conclusive in affirming that the reason for the assault was because the water remained of poor quality, and that it was turned to mud by the mine owner.

In a moment of consideration, the slave-owner descendent verifies that besides the "courageous" men of *Meia Ponte* that made the assault, the big bosses of the time also became involved and contributed to the destruction. Ms. Ita did not wish to prolong on the subject, and I suspect that among these "big bosses" was certainly some member of her family. The end of the interview was not conclusive, as Ms. Ita did not wish to continue talking about the *Lavras do Abade*, and I was not able to finish the coffee that remained hot on the table. Perhaps because of her hearing problems, the old housewife felt some type of uncomfortable noise with my insistence of the issue, or perhaps her patience and memory limits were reached. However, one certainty is maintained: according to the colonel's daughter, the water pollution was the main cause of the conflict, the same water that day by day flows in her backyard to feed her *plantel*.

The Modern Elder

The last interview was with the oldest and most active *Pirenópolis* resident, Mr. Boanerges Oliveira, a reformed doctor, who is 97 years old. Contrary to what I have expected, the interview with Mr. Boanerges revealed little information about the *Lavras do Abade* conflict. This is, in part, the result of his advanced age, which he agreed strongly affects his memory, and due to his interest in discussing only contemporaneous issues. The first expression that I heard from him about the *Lavras do Abade* subject was: I do not want anything more with the *Abade*. Mr. Boanerges spent more than three quarters of our interview explaining how to walk around the *Pireneus* mountains, the beauty of the place, the good air, the incredible trees, etc. The landscape memory of the old doctor is intact, evidenced by the details he recalled about the old road called *Bandeira* that leads to the *Pireneus* peak, the same road that passed in the middle of the *Lavras do Abade* village, though he never explicitly made this connection.

It was not until the end of the interview that he decided talk about the mine. Mr. Boanerges explained that a long time ago when he visited the ruins, he found an archeological vestige in front of one mountain. Mr Boanerges explains: Was there that I found a bottle, a big bottle of mercury. I was passing there and saw only the neck bottle in the ground; I take this out and discovered a big bottle of mercury. After gesturing enough to simulate the size of the bottle, he continued: It was one of the kilograms of mercury that they used to extract the gold. After this declaration, Mr. Boanerges talked nothing more about the *Lavras do Abade* village; but his silence regarding the conflict can be interpreted as a rich discourse that is shared with the others: probably descendent memories of the “black maskers” inside the old *Meia Ponte* population.

Collective and Cultural Memory of *Meia Ponte* Village

The stories and narratives about the *Lavras do Abade* village are alive today in the minds and bodies of the *Pirenópolis* residents. The interviews presented here are the best examples of this process and a testimony of the past effects in the contemporaneous time. The interpretations that could be made with the rich collection of oral data are numerous, but in this research, I opted for a cross-section analysis and study of these testimonies through the collective memory and cultural memory concepts. In this way, the narratives are placed in time and compared amongst them.

The first comparison that can be made in this study is about the age and social spectrum of the informants. In total, five elderly resident of the city were interviewed: two with more than seventy years of experience, one with more than eighty years, and two with more than ninety years. The first conclusion is that the middle age of the informants is around 85 years old or approximately more than three generations⁸ of *Pirenópolis* residents. These living informants were born roughly during the beginning of the twentieth century, providing a distance of approximately 36 years from the event in the *Lavras do Abade*, or a generation and a half from the incident. As a result, the majority of the informants had access to the history of *Lavras do Abade* only through parents or direct relatives, and not through other fonts or distant media.⁹

The validation of this information is relevant when looking for patterns of reliability in the data. As discussed in the beginning of the interviews, the information revealed here is considered part of an oral tradition, or the history transmitted from one generation to the next, and not an oral history where living the fact is an important part of the process. In the case of studying *Lavras do Abade*, the oral tradition collected was transmitted to the informants through one generation only, or in other words by those who witnessed and participated in the event themselves. Therefore, it is clear that the informants had, through their own life, enough time to formulate or reformulate their opinions about the incident, and construct their own version about the event, but without loss of the details.

In terms of age, the informants are very homogenous, while in terms of socioeconomic rank they are very heterogeneous; the dentist and the doctor represent the middle class, who only reached a stable life condition through rigorous study and independent work. The low class is attributed to the miner and the painter, because the circumstances of both lives are that they are very dependent on their relatives and due to their simplicity in acquisitions of goods. Lastly, there is the high class, identified by the widower housewife, who is an heir of a powerful ancient planter and slave owner; at the same time, the colonel's daughter is also the unique representative of the female sex in the sample. The discourse of the informants also varies among the reasons and the integrants of the conflict, being similar in determined facts, but divergent about the consequences.

The initial similarity in the discourse about the *Lavras do Abade* conflict occurs with the two members of the lower class of the *Pirenópolis* society, the old miner and the

⁸ In this study, I define a generation by 25 years.

⁹ See the discussion about social memory in this chapter.

handicapped painter. Both associate the beginning of the conflict with economic aspects: according to the miner, the assault was realized by the actions of Alfredo Arena, in trying to provoke the attack, as his mine did not yield the profits that he estimated. In this case, Arena blocked the clear water accesses to the *Meia Ponte* village, thereby motivating the citizens to appear there and destroy the mine, that offers him government compensation. In an opposed thought, but using the same economic argument, the painter maintains that the *Lavras do Abade* destruction was a consequence not of the losses in the enterprise but by the excess of profits of the mine, but that did not pay the royalties to the city. In his argument, the painter insists that the miners used various strategies, such as road changes, to divert the gold from the *Meia Ponte* tax inspectors.

These two statements, while presenting divergent stories of the destruction of the mine village, share the point of an economic issue, blaming either the loss or profit from the gold. In my perception, both stories can be combined to reach a middle history, because by assuming that the loss argument was used externally of the *Lavras do Abade*, and the profit argument was used internally in the mine, I can conclude that the two arguments are complementary. In this way, if the mine production was diverged by other routes outside of the region, one would normally expect that those inside the area believed that the mine was not producing gold. Following this thought, the elevation of production, and consequently pollution of the river, will be a reflection of the excessive gold exploitation and at the same time, the cause of the conflict.

Another element of similarity in the statements of the miner and the painter concerns the executors of the assault. According to the miner, the group was formed by a few *jagunços* or bodyguards who, under command of their chiefs, destroyed the village. According to the painter, the group responsible by the *Lavras do Abade* destruction was the “black maskers,” probably paramilitary militia contracted for this purpose. Here is another case in which the stories can be combined, as the bodyguards or the militia are revealed as armed groups that follow orders and receive payment for their actions. In this case it is also probable that the attack was engineered and financed by the city elite. However, what this elite society had to say about the event, and how they construct and reconstruct their shared memories regarding the incident, is another discourse.

The association of the three elite statements, represented here by the two liberal professionals and a planter heir, are very similar on two issues. The first issue that combines the discourses is about the cause of the conflict, as all three agree that the main reason for the *Lavras do Abade* destruction was the water pollution. Each informant, however, sees the

water pollution from a different perspective. The dentist and the doctor say that the main pollution that occurred in the water of the *Almas* river was the mercury contamination, while the colonel's daughter attributes the water pollution to the mud from the gold exploitation. However, this provides another instance when it is possible to combine the statements. In the case of the water pollution of the *Almas* river, it is obvious that it was formed initially by mud from the gold exploitation and after by mercury contamination from the gold purification.

The pollution of the water is a fact, however the population's perceptions of this varies; in the case of the low classes, this pollution was associated with production, while to the middle and high classes, it was a case of hygiene and posteriori health. Therefore, it is not conclusive with other historical and ecological studies¹⁰ if the nineteenth century *Meia Ponte* population recognized mercury as a poison and understood the level of intoxication that this element can relegate to the human body and the environment. In this way, I believe that the argument about only the mud or "dirty" pollution is more proximate with the common sense of the *Meia Ponte* residents at the time. On the other hand, the mercury argument is presented by the two health specialists, and as is expected they had more control and employment of the medical discourse.

The second element of association among the statements of the middle and high class informants regards the members of the assault group in the *Lavras do Abade* conflict. Here, I have three different arguments to the composition of this group. According to the dentist, the group was formed by all of the *Pirenópolis* society; however, to him, his equals, or liberal professionals, compose this society. According to the colonel's daughter, the group was formed by the "courageous of the city," who were also supplemented with the big bosses of the city. The doctor did not want give any declaration about this issue, but his first statement was clear enough, saying that: I want nothing more with the *Abade*. On the other hand, his silence on the subject was also an indication that some "doctor" was probably involved in the conflict.

The elite position about the formation of the group that destroyed the *Lavras do Abade* village in 1887 was not totally ambiguous; besides the suppression of details, the three statements were obvious, presenting the pan-dimension of the facts. The *Lavras do Abade* conflict was an issue that mobilized all *Meia Ponte* society, but at different levels of participation, and, in this case, it is also possible to combine these last three testimonies with the first two. In this way, it is perceived that the lower class blamed a subaltern group for

¹⁰ See the third and sixth chapters.

executing the assault, insisting that the middle and high classes were an elite group that organized the attack. Consequently, participation of the elite in the event was decisive, but restricted to a political plan of action, reflecting the dissimilar statements from the successors of the “black maskers” in the community, and reflecting his chiefs until today.

Social Memory of *Pirenópolis* City

The social memory of *Lavras do Abade* is a “shamed memory,” because there are no remaining “loser” groups to claim it, or if there are, these groups are today so dispersed that no mutual interests have been created among the descendants. As a result, the community investigated in this case study was the “winning” community, the descendants of old *Meia Ponte* population that attacked and destroyed the gold-mining village in the nineteenth century Mid-Western Brazil, and who today live in *Pirenópolis* city.

Nevertheless, if the *Lavras do Abade* site is considered a forgetful memory-place of the event, the assault on the mine is today a remembered incident that conforms to the winner’s strict point of view, in the local narratives. In this way, the assault is a remembered event that was transformed into historical fact and is immortalized in legends and myths, a remembered event that today lives in the *Pirenópolis* society throughout its festivities. To demonstrate, it was selected as a festivity element in the religious calendar of the city that probably carried out traces of the *Lavras do Abade* incident, characterizing it as a “shamed memory” of this political conflict.

The *Festa do Divino Espírito Santo* or Holy Spirit Festival is a catholic ritual that happens seasonally in all of the rural zone of Brazil. It has origins in fourteenth century Portugal as commemorative banquets for the poor, held fifty days before Easter. In Brazil, it has been customary since the colonial period, although it had some particularities in each region as well as some common elements, such as the white dove, saint crown, heart of Emperor and distribution of alms. However, the noble character of the festival has not changed.

According to Brandão (1978) the *Festa do Divino Espírito Santo* has been celebrated in *Pirenópolis* since 1819, when it was first promoted by Colonel Joaquim da Costa Teixeira. The festival has a cyclical system which divided into the religious sphere and the profane sphere. The church rituals and ceremonies to the Holy Spirit characterize the religious sphere, while the profane sphere is the popular succession of fun and games. The festival is a symbolic representation of rural, everyday life in the farm communities. Brandão argues that

the festival combines different rituals of the Catholic Church, each one conserved and redefined by popular tradition. The festival in *Pirenópolis* city, despite the popular character, was always organized and controlled by church and city authorities.

The festival consists of many profane moments, including the *Folia do Divino*, or one religious commission that travels from rural to urban houses carrying the Holy Spirit flag, distributing alms and summoning people to the festival. The *Folia* is always preceded by the *novenas* or one who orchestrates and choirs mass to the Holy Spirit that is followed by processions and fireworks shows. The festival is also stage to numerous folkloric groups' presentations, such as: *Batalhão do Carlos Magno* (elite theatre), *Contradança* (elite dance), *Congadas* (slave dance), *Dança do Tapuio* (indigenous dance), *Catira* (rural dance), *Pastorinhas* (religious theatre), and *Cavalhadas* and *Mascarados*, which the last two are described below.

The *Cavalhadas* is a religious representation of Muslim and Christian medieval fights inside of the Holy Spirit Festival. Two troops with twelve knights each are divided into two teams, the blue Christians and red Muslims. These two knights' troops stage a choreographed fight in a specific field with spears and swords over the course of three days. The knights and horses are richly decorated, as is the court (king, general, princes, princesses, ambassadors and lackeys) who watch everything. The participants are generally distinguished members of the society, and the organization, as well as their performance is rigidly guided by military patterns.

The *Cavalhadas* battles last three days; on the first day the Christian knights kill the Muslim spy, after which both ambassadors are sent to negotiate the redemption to each side. The first day proceeds with the encounter of the kings and fights between the knights and ends with an armistice proposed by the Muslim king to the Christian king. The second day is marked by the redemption of Muslim knights after the second fight, who is baptized at the end of the day. The third day is dedicated to the tournament between the knights that is compounded by horse proves, such as *cabeçinhas* (shout competition) and *argolinhas* (spears competition).

According to Brandão (1974) the *Cavalhadas* was introduced in *Pirenópolis* during 1826, by the priest Manuel Amâncio da Luz. Brandão explains that the *Cavalhadas* are a dramatic, profane and social ritual, serving as a representation of historic events recognized as truth by its participants. Therefore, to Brandão the *Cavalhadas* in *Pirenópolis* are a symbol of identification and are united with Christian values, and a perpetuation of ideological and political order by the local elite. In this way, the *Cavalhadas* could also be

interpreted as a theatre of social memory, where the past is embodied and enacted to transform it into a medium of historical transmission. Although the *Cavalhadas* are a theatre of memory from the elite segment, it is also directed to all *Pirenópolis* society, and its schemata's goes beyond the perpetuation of the present social order.

In opposition to the knights inside the *Cavalhadas*, there are the *Mascarados*, or an inversion of the values of the knights, without a "historical" explanation. "Knowing that they are antique and that their importance grows as attraction each year, as well as each year the number also increases, as their 'tendency to organize'" (author translation) (Brandão, 1974:151). The *Mascarados* or *Curucucús* are participants of the performance in the *Festa do Divino* and consequently *Cavalhadas*, but they have neither a narrative association with the ceremony or a datable origin in popular folklore.¹¹ They are identified as people able to stay anonymous through the use of masks, and therefore travel on horses around the city scaring people and demanding alcohol and cigars.

According to Brandão (1978) the *Mascarados* go to the streets on Saturday of the Holy Spirit festival; many are covered by paper masks depicting bulls with enormous horns and flowers. They are also dressed in colorful and brilliant clothes, and ride near the city during the afternoon and night, until Tuesday. The maskers are always comprised by a group of young riders, which, according to tradition, cannot be identified by anybody, including one's own parents, during the time of the rides. The maskers also participate into the *Cavalhadas* during the interval of presentations, and with the musical band in the final ceremony, to culminate the festival in the Emperor's house.

Brandão (1974) also explains that the maskers are divided into three groups. The first group of maskers is dressed in black and white, with masks of bulls in the same color and many white flowers in the horns. The second group of maskers identified as *do Catolé*, wear blue and red striped clothes, stuffed with grass to deform the body, and their head is covered with fabric masks and straw hats, with flowers. Finally, the third and last group is a mixture of the other two groups, and the inclusion of other members, with animals and feminine masks or dresses with complete modern costumes.

¹¹ "There is no doubt that today they are closely connected with the *Cavalhadas*. However, it is necessary to know if it was always like this, or if sometimes they arrived to incorporate the festival. Anyone in the *Pirenópolis* city was capable of explaining to me the motive and origin of the maskers during the three days of *Cavalhadas*." (author translation) (Brandão, 1974:82)

The presence of *Mascarados* inside the *Cavalladas* and *Festa do Divino* rituals of *Pirenópolis* city is a curious case, but not totally incomprehensible or of simple explanation.¹² If we associated the historical information about the old *Meia Ponte*, with the social role of the group today in the festival, it is possible to trace some parallels that lead to the event of *Lavras do Abade*. In this case, the history of the *Lavras do Abade* conflict is partially used by the social memory of the *Pirenópolis* citizens; partially used, because the memories selected about the conflict are only the “winners” remembrances, while the “losers” are socially forgotten.

Besides the masks and the use of horses, other elements also connect the *Mascarados* of the festival with the assault group of young cowboys of 1887. First, is the objective of the maskers in the festival, which is provoking anarchy in the city over the course of three days.¹³ Much like the assault event in the mining village, the maskers today continue to attack and rob the people in the streets, though clearly it is in a more theatrical and far less bellicose way. Second, is the connection between the maskers and the *Almas* river, which is the encounter point to this folkloric group during the entire festival.¹⁴ Here, the social memory of the conflict is perpetuated by the river/society connection and by the direct relationship of the maskers with the natural element.

It is the process of forgetting and remembering that determines what past facts about the historical conflict are to be corroborated in the construction of the contemporary discourse, and which are the social memories of the event. The acting performance about the *Lavras do Abade* conflict is clearly maintained by the community stakeholders; therefore, they do not participate directly. To this proposal, a religious character is assumed that inserts the movement in other social schemata. However, if the maskers were not present in the introduction of the Holy Spirit festival in 1819, or in the beginning of knight’s medieval battles in 1826; it is probable that in 1887 they were in some way “remembered” during the *Lavras do Abade* conflict.

¹² Some actual *Pirenópolis* residents believe that the history of *Mascarados* is only related with the slaves and aggregates that without permission of his owners hide the face to participate in the festival.

¹³ “In the past to avoid problems, the maskers could circulate in the city only until the seven o’clock of night.”(author translation) (Montenegro, 2009:07)

¹⁴ “The river-city connections are many and can be exemplified with other important local icon: the Holy Spirit Festival, when the maskers that animate the party and receive all the attentions had in the *Almas* River the central point of encounter to quench the thirst of the horses (...).”(author translation) (J. G. d. T. Curado & Lôbo, 2008:05)

Forgetting Places and Remembering Objects

Finally, a practice that is so common in all of these processes of collective, cultural and social memory, is the action of forgetting. Despite the individual and psychological conditions of repressing certain remembrances, or the substitution of learning knowledge, forgetting would be interpreted in a social level as a consequence of memory formation. Burke (1989) discusses the “social amnesia” or the rules of exclusion, suppression or repression, and the social organization of forgetting. For Burke, the social amnesia is used to reference ‘acts of oblivion,’ official erasure of memories of conflict in the interests of social cohesion. Consequently, the suppression of determined past facts would be corroborating with the construction of the remembering discourse; in this case the forgetting is another “instrument” used by determined groups in society for constructing their shared, present-day memories.

According to Holtorf and Williams (2006), landscapes can be defined as perceived environments of human communities in the past and present that incorporate both the natural and the artificial elements. Nonetheless, landscapes are also linked to socially or culturally mediated remembrance and memory, because of their representations of the past and association with social practices. According to the authors, there are two types of landscapes: the accumulative landscape composed by the traces of human actions and the natural features that form the focus of retrospective memories; and the created landscapes that are created by the prospective memories they contain.

To Holtorf and Williams (2006), accumulative landscapes are spaces historians identify as a ‘palimpsest’, or a sequence of traces of the past, that have been built up, written over, and rewritten over decades, centuries and millennia. These landscapes are constructed with retrospective memories and through social practices, but at the same time these landscapes can serve also to hide the past, or make people forget it. In this case, the past is always present in the landscape, but with the selection of what can be elected, suppressed or dispersed. While forgetting can take the form of a violent suppression, it can also be tied closely to remembering, and in this case, the objects, songs, and folks are the substitutes to landscapes markers (as a home for example), or even to imagination.

The social power of a landscape is represented through the particular views and worldviews interpreted and determined by space and place. Using the Pierre Nora approaches, Holtorf and Williams (2006) extend the notion of historical landscape from places and spaces, to include “all realms of memory”, including those that exist only in our

imagination. On the other hand, the created landscapes are formed by prospective memories, which are those that create realms of memories intended for the future. In this case, memorials are the best example; these memorials revitalized during different epochs can quickly acquire political significance, such as war memorials, battlefields, or war cemeteries. Other types of created landscapes are parks and gardens containing references to a desired past, such as family mausoleum or garden cemetery. In these cases, not only the burial ground, but also its death procession are related to and mediated by the landscape.

According to Holtorf and Williams (2006), the “theaters of memory” are other types of created landscapes, as open-air museums, theme parks, and even zoological gardens are created representations. In the theatres of memory, the prospective and retrospective memories are often combined with each other in specific landscapes. For example, churches and surroundings are both retrospective and prospective when combined with evocations of the past and aspirations of the afterlife. The anthropological importance of this is considerable because archaeological sites aggregate values of collective, social and cultural memory of today’s community: a place of remembering and forgetting. This gives important insights into the ways that cultural values are consolidated and as an instrument of heritage valorization and scientific investigation. In conclusion, the *Lavras do Abade* historical landscape is a forgotten place, but also an island of memory, because of the retrospective aspects of the conflict and the prospective appeals to the environmental discourse.

The material culture relating to the *Lavras do Abade* site was gathered mainly through archaeological investigations as showed previously, but some examples were investigated through interviews, and fieldwork in the city of *Pirenópolis*. During the interviews in *Pirenópolis* city, contact was made with the IPHAN (Brazilian National Institute of Artistic and Historic Patrimony) office and Sérgio Galeão, the representative in the city. Galeão, in addition to being a source of contacts and orientation regarding the oral interviews, was also a *Lavras do Abade* researcher and collected some material attributed to the site through donations of the residents in the city.

The first object presented to me was a metal pipe that was donated to IPHAN by an anonymous resident who had used the object as a chimney in the house. This object, of approximately 4 meters extension and 10cm in diameter was identified as a pipe from the hydraulic machine to transport water from the tank to the hose. The pipe’s body was very rusty and the two extremities were completely decomposed. Found in the body of the pipe were the thumbtacks used to tie the narrow iron sheets that form the pipe. According to Bowie (1898) large mining companies often constructed their own wrought-iron pipes

(punched and rolled) in their workshops, which is totally plausible regarding the *Lavras do Abade* mine, in addition to the fact that the village had its own smithy. However, the iron plates also could be created outside of the mine, because the size and thickness are very important in determining the water pressure inside (Figure 5-1).

The second object was a fragmented medicine glass bottle in blue cobalt with the inscriptions “Leite de Magnesia de Phillips” – Phillips Milk of Magnesia. The Phillips Milk of Magnesia is an alkaline suspension of magnesium hydroxide that was invented by the Englishman Charles Henry Phillips in 1873, but the blue bottle was only patented in 1906 and largely produced in the United States after 1911 (Phillips & Reid, 1873). In Brazil, its production started in 1930 with imported bottles, but domestic production began in 1949, with Cispor or actually Owens-Illinois Brazil the only company capable of producing blue cobalt bottles (Palhares, 2007). However, it is therefore not difficult to believe that this bottle is from the occupation period between 1880 to 1887 in the *Lavras do Abade* site. Besides the possible differences between the dates of production and documented registration, the bottom base has an inscription that dates the bottle from 1881! Therefore, more studies need to be dedicated to this subject (Figure 5-2a).

The third element was an iron object weighing nearly 50kg, with dimensions of 51cm in height, by 15cm of square at the bottom and 4cm at the top. A group of topographers in the *Lavras do Abade* site recovered it in 1985. Today, the piece is part of an eclectic collection in the city’s tourism office. In the mining portion above the sawmill and watermill structure, the group also found an iron wheel weighing approximately 4.5kg (Andrade & Leite, 1986). The iron piece was probably the whip block of a derrick system with the iron wheel. According to Bowie (1898) the derrick system in hydraulic mines were commonly used to facilitate the removal of large boulders and blocks, which could lift stones weighing up to eleven tons. The piece is well preserved, and other than some rust, its integrity is intact (Figure 5-2b).

The fourth element was a private collection of coins. Though the coins were never physically presented to the researcher; pictures were sent by email after the completion of the fieldwork. The coins are probably part of a major collection of other coins, but the identification of the objects related with the *Lavras do Abade* site is notable. The first two coins are similar in that they are gold covered with the inscription of “Arena Garante” or “Arena Garana” – Arena’s guarantee – on both sides and “10” on the other side. The third coin is different, covered by silver and with the inscription “Arena Garante 62” and a small hole in the top, resembling a charm (Davidson, 2004). The fourth coin is made of gold or

another metal. It does not have a circular hole in the center and the inscription “Moeda Abade Arena Garante” – Abade’s coin Arena’s guarantee (Figure 5-3).

In regards to the artifacts above presented, it is clear that more research needs to be done, not only about the intrinsic and extrinsic characteristics of each object, but also about their memory context in the *Lavras do Abade* site and *Pirenópolis* city. The removal of certain objects and its appropriation by the old *Meia Ponte* village residents is a strong indicator of material memory attached to the conflict. In conclusion, the artifacts above are an undeniable demonstration of the material memory importance in the construction of social relations, what in the case of the *Lavras do Abade* event could be interpreted as “spoils of war”.

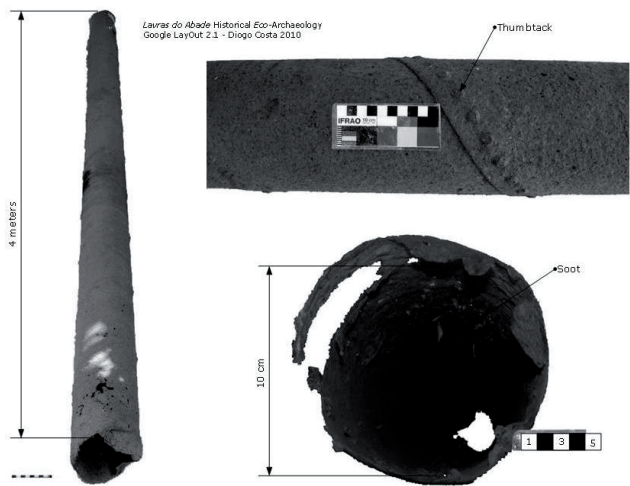


Figure 5-1. Pipe from the hydraulic machine used as chimney.

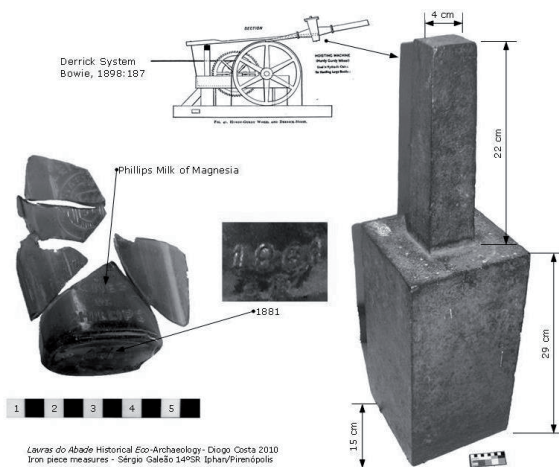


Figure 5-2 (a-b). Bottle collected from the site and piece exposed in museum.

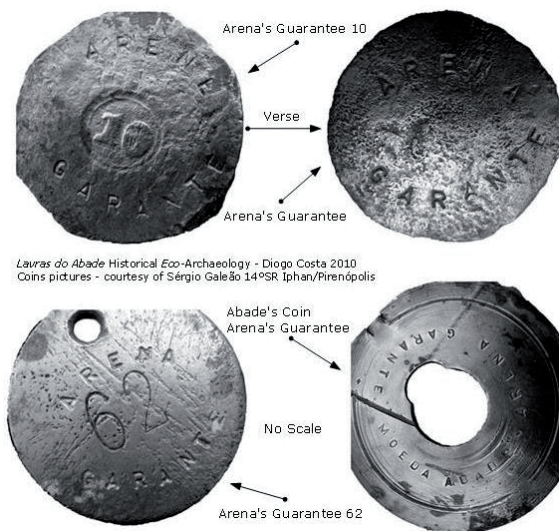


Figure 5-3. Coins from a private collection.

CHAPTER 6

ENVIRONMENTAL STUDY OF THE *ALMAS* RIVER

Ecology and Archaeology at the *Lavras do Abade* Site

Ecology studies transformations of the natural world, while archeology researches the material products made by humans in certain historic periods. This study combines these two perspectives to study the relationship among the *Almas* river ecosystem, the *Lavras do Abade* archaeological site and the city of *Pirenópolis* (old *Meia Ponte*). Historical ecology and archaeological study of gold exploitation in the *Cerrado* (Brazilian Savannah) is a fertile space to understand the construction of landscape, as well as the control and use of environmental resources at the end of nineteenth century Brazil. In addition to the case study of *Lavras do Abade* here is also considered the characteristics of the *Cerrado* biome and the historical process of mining impacts. These two aspects are necessary to understand the relationship between humans and nature in a dialectical relationship of use and exploitation of water systems and mineral resources in the Mid-Western Brazil.

According to Winterhalder (1994), history is the descriptive chronological account of selected events given coherence and finiteness, through reference to some theoretical proposition, analytical problem, or limitation of space and time. Ecology, meanwhile, refers to the holistic study of relationships among living organisms or between them and the physical environment. To Balee (2006), historical ecology is a relatively new field in ecological studies, and its studies have continued since to evolve human interactions with nature, until the methodological actions involve both environmental history and ecological anthropology, though with a strong dialectical point of view.

Therefore, according to Crumley (2006) the multidisciplinary approaches that historical ecology has employed offers a different perspective from either cultural ecology or environmental history. First, because historical ecology is absent from the environmental determinism present in an evolutionary perspective, which is currently in other ecologically oriented anthropological works. Second, because historical ecology deals with historical concepts such as event, conjuncture and long-duration as environmental history (Balee & Erickson, 2006), historical ecology strongly focuses on the dialectical relationship of the biospheres response to the human actions.

According to Balee (2006), the main difference between historical ecology and an ecological anthropological view is that cultural ecology is not applied in the study of complex

societies, such as in the study of the peasant communities. The different socioeconomic strata of peasant communities could not be analyzed by the methodology of ecological anthropology because such societies have not been shown to have the same long-term effect on the local environments as the prehistoric indigenous people have. Environmental history also takes a different approach than historical ecology; historical ecology subscribes to a single theory of history and is very different from a historical approach that offers a scientific model of how and why the landscape was transformed through the study of chronological events. For Balee (1998), historical ecology uses four postulates to understand the environment: all human actions affect the biosphere; human effects are at once the extinction and creation of biomes; sociopolitical and economic systems are responsible for the modifications at a regional scale in the biosphere; the human communities and cultures in the landscape are understood as a total phenomena.

However, a critique made by Stahl (2007) claims that “historical ecology has emerged along with other contemporary ecologies as a framework for reinvigorating a neo-functional ecological anthropology that failed to adopt a diachronic perspective” (Stahl, 2007:03). In response, one could refer to Cohen (1976) who explains that the numerous types of views of the environment and the different perspectives that each person has about the environment defines how they act toward them. To Cohen, four orientations of relationships between humans and nature can be defined: instrumental, territorial, sentimental and symbolic. Each orientation corresponds to a single purpose, mode, mechanism, process, organization, institution and functional sphere. The orientations also result in three distinct types of relationships between humans and nature: the conflict between various environmental orientations; the differential impacts of various orientations on the ecosystem; and the differential dynamics of orientations and ecosystems. In this way, historical or social ecology is a multidimensional approach to the spheres of relevance and interdependencies of ecosystems along with their relations with the ecological orientations.

Similarly, all these approaches had in common the absence of history as a way of explanation, or as Hardesty and Fowler (2002) propose an intersection between “ecohistories” and meanings. The value of an environmental, (historical) archeological study includes human-environment interactions that take place at the scale of localities, regional, and at a global scale. The main element to historical site research is that the archaeological record is a particularly strong document of environmental changes, occurring over the past

five hundred years, and it is a unique register of the period of time that historians refer to as the 'modern world'.⁷⁵

The historical ecological and archaeological approaches in this dissertation follow three arguments. First that the landscape is a historical construction, and "the product of collision between nature and culture, wherever it has occurred, is a landscape"(Balee & Erickson, 2006:2).⁷⁶ In this way, a different conception of landscape history can be employed: one that sees the recent spatial heterogeneity as a reflection of ecosystem clusters and includes the human temporal changes in the environment. According to Crumley (2006), the landscape perspective of historical ecology (and also of historical archaeology) is a unit of analysis in several disciplines, broadly defined as the spatial (and time) manifestation of the relationship between humans and their environments.⁷⁷

Secondly, as Swetnam and others (1999) argue, an essential feature of historical ecology is a sufficiently long period of observation so that meaningful information can be gained about changes in populations, ecosystems, disturbances and dynamics. According to Swetnam and others, the sources, time frames, and temporal/spatial resolutions of archival information in historical ecology are highly diverse, and include documentary and "natural" archives types. The later include earth-system processes, such as sedimentation, animal deposits and annual plant growth cycle.

Thirdly, that we are no longer living in the Holocene⁷⁸ epoch, but in a superior geological stratum called Anthropocene.⁷⁹ According to Zalasiewicz and others (2008), the rise of populations since the beginning of industrialization has changed the stratigraphy of earth. Zalasiewicz and others collected and presented a profusion of data that regard the processes affecting the production and characteristics of a contemporary geological epoch. Crutzen's (2002a; 2002b) studies in concentrations of carbon dioxide and methane in glacial ice cores demonstrated that in the last two hundred years the global effects of environmental

⁷⁵ "Environmental archaeology also is a significant source of information about ecological change brought about by industrialization within a world system context"(Hardesty & Fowler, 2002:82).

⁷⁶ Although this is a critiqued concept (Oyuela-Caycedo, 2007).

⁷⁷ To more reference see: "Historical Landscape of Lavras do Abade site" in the seventh chapter.

⁷⁸ "The last glacial age, some twelve thousand years ago, has given way to a period of relative warmth termed the Holocene (or Recent). The Holocene is further divided into various periods of greater or lesser warmth and rainfall"(C. L. Crumley, 1987:05).

⁷⁹ "The concept of Anthropocene refers to the dominant role that humans play in the structure and function of the environments during the last 200 years" (Borrero, 2007 :01).

changes made by man are profound. Crutzen (2003:251) believes that environmental changes made by man effectively began with the invention of the steam engine in 1784. The *Lavras do Abade* research is part of this initiative, which can be considered only as a local conflict about water resources, but also can reach the status of global reference about the mining pollution process in the industrial period.

The *Cerrado* Biome in Mid-Western Brazil

The *Lavras do Abade* study is a research program that intends to combine different sources of analyses to reconstruct the events that occurred in 1887. In this way the contemporaneous environmental and historical investigations are important elements of this mosaic of information surrounding water conflict in the old mining village. The past and present environment in the *Pireneus* mountains is characterized as a singular and essential reserve of *Cerrado* biome. The *Cerrado* is the second largest biome in Brazil but, despite this, its importance is sometimes minimized due to focus on Amazonian or Atlantic Forest studies. The *Cerrado* (which is the Portuguese word for "closed" or "inaccessible") is the mainly tropical savanna and scrub forest ecosystem of South America.

Ecological Characteristics of the *Cerrado*

The *Cerrado* is approximately 1,916,900 km² (740,100 square miles) in size, covering all the Brazilian state of *Goiás* and the Federal District, most of *Mato Grosso*, *Mato Grosso do Sul*, and *Tocantins*, the western portions of *Minas Gerais* and *Bahia*, the southern portions of *Maranhão* and *Piauí*, and small portions of *São Paulo*, *Roraima* and *Paraná*. The *Cerrado* extends also into the South America continent; it reaches to the northeastern part of Paraguay and the eastern part of Bolivia. The *Cerrado* accounts for 22% of Brazil's area, is bigger than Alaska, and is the largest savanna in South America. According to Motta and others (2002) the *Cerrado* tends to maintain itself with more tenacity than other vegetation because the climate and soil factors are not extreme.

The *Cerrado* biome and climate are also of some importance to the Brazilian ecosystem, because despite its privileged and strategic geographical position, it contains a significant biodiversity in the Brazil. The *Cerrado* is characterized by an enormous range of plant and animal biodiversity. According to the World Wide Fund (Nature), it is biologically the richest savanna in the world. The *Cerrado* borders all of Brazil's major ecological

systems, including the Amazon basin in the north, the *Chaco* and *Pantanal* in the west, the *Caatinga* in the northeast, and the Atlantic forest in the east and south. The *Cerrado*'s typical climate is hot, semi-humid, and seasonal, with a dry winter season from May through September or October. The annual rainfall in this biome is around 800 to 1600 mm.

The major concentration of *Cerrado* is localized in the central Brazilian plateau; which is a headwater for the three main hydrographic basins in Brazil (Amazon, *São Francisco*, and Paraguay) and responsible for the most extensive agriculture in the country (Gusmão, 1979; Marchetti & Machado, 1979), despite generally poor soil characteristics. According to Motta and others (2002) the latosols or oxisols⁸⁰ tend to have good physical but poor chemical properties. The good physical properties are mainly due to high aggregate stability, while the poor chemical properties are low nutrients, such as Phosphorus and Calcium, and low micronutrients. Most of the *Cerrado* is located on large plateaus, broken by a network of depressions and river valleys. Several of South America's major rivers, such as the *São Francisco*, *Tocantins*, *Araguaia*, *Xingu*, and Paraguay rivers, have headwaters in the *Cerrado* area.

According to Furley (2006) the *Cerrado* biome has one of the richest flora of the world's savannas and is also equally rich in fauna (other than mammal species), especially birds, fish, reptiles and insects. The flora is characterized by a unique association between xeric aspects⁸¹ and the abundance of water resources, which have adapted to seasonal fires. The *Cerrado* landscape is characterized by extensive savanna formations crossed by gallery forests and stream valleys, which includes various types of vegetation. In this area there are three major types of vegetation: the humid fields and *Buriti* palm paths that are found where the water table is near the surface; the alpine pastures that occur at higher altitudes; and the mesophytic forests⁸² on more fertile soils.

Therefore, the savannas are not homogenous, because there is a great variation between the amount of woody and herbaceous vegetation, forming a gradient from completely the open *Cerrado* (grasses) to the closed forest-like *Cerradão* (canopy forest). According to Klink and Machado (2005), the *Cerrado* has a rich and generally unappreciated biodiversity. More than 1600 fauna species have been identified in the *Cerrado*, including 180 reptile

⁸⁰ Latosols are formed by the decomposition of parent rocks, without silica or humus and presenting a reddish coloration because the concentrations of iron and aluminum.

⁸¹ Plants that require only little water to grow.

⁸² Plants adapted to dry conditions.

species, 113 amphibians, 837 birds and 199 mammals. Among the invertebrates, the most notable are termites and leaf-cutter ants. They are the main herbivores of the *Cerrado*, important for consuming and decomposing of organic matter, as well as constituting an important food source for many other animal species.

Among the *Cerrado* types, however, there are some exceptions, as stated in the work of Barbosa and others (2007) about the *Lavrados* in *Roraima*⁸³; Barbosa and others consider this formation a relic of older periods, in that northern South America and parts of Mesoamerica were covered by savannas in the Pleistocene period. The biodiversity of this ecosystem is represented by the interaction of different systems, which today are affected by the human intervention in the area such as cattle. However, in comparison with the Brazilian central savannas, the northern Roraima savannas have poor quantity of arboreal species because of their disconnection with the Brazilian central plateau and isolation from the Guyana shield; with the fauna the same occurs, as there is more similarity with the fauna of open areas of Venezuela than with the central Brazilian savanna. Barbosa and others conclude that despite some studies the *Lavrados* of *Roraima* are still totally unknown, mainly because of the headwaters and watercourse, conservation of terrestrial carbon, ecological corridor and scenic patrimony.

Ecological Research of the *Cerrado*

Systematic research about the *Cerrado* have large developed since the nineteenth century; however discussions of the physical characteristics of this biome system have always existed. Goodland (1979) makes an interesting bibliographical retrospective of ecological studies about the *Cerrado*, presenting the first descriptions of Brazilian savannas from the voyagers of K.F.P. von Martius, publicized in the *Flora Brasilienses* (1840-1906), through the first systematical ecological study conducted by Warming in 1892 and 1908 in the region of meridian *Minas Gerais*.

According to Goodland,(1979) the question of the dry and xeric scrubland characteristics of *Cerrado* vegetation had been present in the academic discussions for a long time. Rawitscher in 1942 and Ferri in 1943 were the first two scientists to undertake experimental work on the subject; while the periodic fires as mechanisms of conservation

⁸³ The north Brazilian Savannas or *Lavrados* and the central Brazilian savannas or *Cerrado* has despite some biome similarities also notable differences in their vegetations.

were studied by Richard-Edwards in 1956. In 1957 Hueck affirmed that the *Cerrado* suffered a historical regression because the forest invasion since ancient times.

Goodland (1979) also explains that beside all these investigations in the nineteenth and twentieth centuries, the major problem with the *Cerrado* was its similarity with the *Caatinga* biome. Arens solved this problem in 1958 with the theory of *escleromorfismo oligotrófico*; or the premise that despite the water abundance for production of carbohydrate and fat in excess, the plants in *Cerrado* lack mineral nutrients, and because of this they still produce small quantities of protein that result in their being less developed than the similar *Caatinga* vegetation.

Otherwise, the modern historical ecology studies of *Cerrado* are mostly centered on the discussion of anthropogenic impacts on the biome. According to Ledru (2002), the *Cerrado* and forest can occur in the same region, at the same latitude, and under the same climatic conditions, which suggest a human-induced origin based on observations of fire-adapted species and the development of dry forests under the influence of fire. Alternatively, the occurrence of *Cerrados* in areas only recently occupied by humans and the discovery of extinct giant mammals living in open forest landscapes at the end of the Pleistocene and beginning of Holocene⁸⁴, suggest a natural logic.

However, historical ecology studies present a solution to the anthropogenic problem of *Cerrado* formation with the palynological studies initiated by Labouriau (1973) and restarted by Ledru (2002). According to Labouriau and Ledru, the earliest records of typical *Cerrado* vegetation dates back to 32,000 B.P.,⁸⁵ while the vegetation substitution did not occur prior to 7,000 B.P. in central Brazil and 10,000 B.P. in northern Brazil. Labouriau and Ledru explain that the change in the vegetation occurs through a progressive increase of seasonality, concomitant with an increase in temperature, in addition to man's influence, which contributed to an increase in fire frequency. On the other hand, local improvements in *Cerrado* vegetation are recorded in most forest areas when climatic conditions became drier and/or colder. During these periods the forest exemplars remained connected through a network of galleries, until the period of heat.

In terms of the seasonal fire, Miranda and others (2002) claim that in the actual stage of knowledge the fire is a common feature for most of savanna ecosystems. Sustained by archaeological and anthropological studies Miranda and others argue that indigenous people

⁸⁴ Around 12 000 years ago.

⁸⁵ Before Present in radiocarbon date is before 1950.

in the *Cerrado* used fire for hunting, stimulation of fruit production, control of undesirable species and tribal war. Therefore the indiscriminate use of fire has consequences, because the alteration in the regeneration rates of woody species and high mortality rates suggest that the biennial fire regime is changing the physiognomies of the *Cerrado* to an even more open form, with grasses as the major component of the herbaceous layer.

Ecosystem of the *Pireneus* Mountains

The geological characteristics of the *Pireneus* mountains are described by Motta and others (2002) as shaped by high tablelands of 900 to 1,100m of altitude with slopes of 3°. The surface is covered with a thick layer of Tertiary-Quaternary sediments formed by hard iron-rich fragments (petroplinthite), and highly resistant to erosion. Quartzite mountain crests generally also appear, as in the case of the *Lavras do Abade* area, where the table-lands are eroded rapidly by parallel slope retreat. In addition the soil's composition is explained by Eiten (1990) as normally shallow, with white sand due to the quartzite, and often containing a high quantity of humus, that becomes black.

The *Pireneus* mountains is today inside of the *Serra dos Pireneus* State Park (PEP), an ecological unit of preservation of the *Cerrado* created in 1987⁸⁶ with 2.833 hectares. The *Lavras do Abade* archeological site is within the surrounding Environmental Protection Area (APA), which was created in 2000⁸⁷ with 22,800 hectares. The PEP and APA are localized on the outskirts of *Pirenópolis*, *Corumbá* and *Cocalzinho* cities, and also include the *Pireneus* peak (1,385 meters) and *Cabeludo* hill, as well is the watershed division for the Platina and Amazon water basins, which includes the fonts of the *Almas* and *Corumbá* rivers. The fauna and flora, as presented before, are characteristic of the *Cerrado* biome, and the condition of the PEP and APA are well preserved with native exemplars in the area of the *Lavras do Abade* site and adjacent.

According to Lamy and others (2006), among the numerous flora exemplars in the area there is a focus on the *Jacarandá*, the *Canela-de-ema* and the *Pau-papel*, which is the state symbol tree of *Goiás*. On the other hand, fruit trees include *Pequi*, *Buriti*, *Baru*, *Mangaba* and *Caju*; and among medicinal trees *Sucupira-branca*, *Lobeira* and *Arnica*. Generally fauna species are also included, as birds *Ema*, *Seriema*, *Papagaio-galego* (endemic), *Azulão* do

⁸⁶ State Law 10.321/87 (Lamy, Leuzinger, & Pinto, 2006:06).

⁸⁷ State Decree 5.174/00 (Lamy et al., 2006:07)

Cerrado, *Mineirinh*, and *Príncipe*. Mammals *Macaco-prego*, *Guariba*, *Vead*o *mateiro* and *Tamandua-bandeira*, as well as a great variety of rodents, and also lizards and snakes.

According to the environmental study of *Goiás* State (2005), the region is very hydraulically important due to its characteristic as a watershed between two distinct hydrographic basins. The boundaries of the watershed are the *Catingueiro* mountains, passing by the *Pireneus* mountains, until reaching the *Vendinha* mountains at south. In consequence the *Corumbá* river presents a water basin with approximately 117, 5 Km², while the *Almas* river has a water basin with approximately 98, 2 Km².

The *Corumbá* and *Almas* rivers were also the main receptacles of gold mining environmental impacts in the nineteenth century, and also the principle point of contention between the villages. The *Corumbá* river is the main river in the region of the central plateau, covering an area where gold prospectors in the eighteenth century founded many villages. The *Corumbá* river was the path early gold seekers followed on their long trek from *São Paulo* through the *Cerrado*. The *Corumbá* river receives waters from the *Descoberto* and *São Bartolomeu* rivers, which flow from the Federal District and goes until the *Paranaíba* basin that combines with the great *Platina* basin.

The *Almas* river begins in the highlands of the *Serra dos Pireneus* State Park, and divides the center of *Pirenópolis* city when it later flows to northwest and joins the *Araguaia* and *Tocantins* rivers, until reaching the *Amazon* basin. The river becomes strong when it reaches the *Belém-Brasília* highway and has many small but treacherous cascades that may have led to its name, the "River of Souls". The *Almas* river suffers today from pollution from the sewers of several towns along its course, and yesterday from the mining activities that populated the mid-western Brazilian *Cerrado* looking for gold and precious stones.

The gold exploitation of the *Lavras do Abade* was conducted inside of this rich panorama, with natural resources such as woods and stones for construction and the abundant water resources to operate the hydraulic dismount. The *Cerrado* is not, in the case of the mine, a mere spectator of the transformation carried out by Alfredo Arena and CMG Company, but an active element that provided the necessary resources to make the enterprise executable and profitable. The human return, on the other hand, was characterized by the heavy extraction of the ore and degradation of the area with lazy disposal of the waste. These actions affected the immediate time and space while also creating a perpetual heritage of environmental degradation.

Mining Impacts of the Nineteenth Century

The gold mining exploitation in the *Lavras do Abade* was one of the main factors of environmental impacts at the end of the nineteenth century *Cerrado*, Brazil. According to Kelly (1998) the types of environmental effects observed in mining areas are also related to the method of ore extraction. In this way, I will first make a retrospective of the mining techniques, and especially the procedures adopted in the *Lavras do Abade* mine; second I will approach the environmental impacts of these techniques and the specificities of each exploitation stage; and third I will presented some considerations about the study of historic mining pollutions, its limits and particularities in the present day.

According to Pasava and others (1995), mining is the extraction of valuable minerals or other geological materials from the earth, usually (but not always) from an ore body, vein, or (coal) seam. Materials recovered by mining include bauxite, coal, copper, gold, silver, diamonds, iron, precious metals, lead, limestone, nickel, phosphate, oil shale, rock salt, tin, uranium, and molybdenum. Any material that cannot be grown through agricultural processes, or created artificially in a laboratory or factory, is usually mined. Mining in a broader sense can also include the extraction of petroleum, natural gas, and even water. In the *Lavras do Abade* historical landscape, the main objective of ore exploitation was the gold extraction.

Mining Techniques and Gold Exploitation

According to Bowie (1898), the mining system in the nineteenth century was always associated with a type of ore deposit, but can be divided into two basic types of exploitation: surface-mining and deep-mining. In the case of *Lavras do Abade* the type used for the ore exploitation of *Pireneus* mountains was the surface mining. Surface mining is a type of mining in which the soil and rock that covers the mineral deposit are totally removed. Surface mines are typically enlarged until either the mineral deposit is exhausted, or the cost of removing the larger volumes of overburden makes further mining uneconomic. Inside of the surface mine types there are many techniques to remove the soils, and in the case of *Lavras do Abade* two types were mainly used: *placer* mining and hydraulic mining.

Bowie (1898) in his manual of nineteenth century mining, also explains that *placer* mining is a specific technique of the open cut method which was largely employed since ancient times. In the *Lavras do Abade* mine it was originally conducted since the beginning

of exploitation in the area during the eighteenth century, until the arrival of CMG Company in the end of the nineteenth century and the change to hydraulic mining technique. *Placer* mining refers to the mining technique of looking for minerals in the deposits of sand and gravel in modern or ancient stream beds. This may be done through the open-pit or open-cast procedure or by various forms of turning riverbeds. The name derives from Spanish word, *placer* meaning "sand bank" and referring to precious ore found in alluvial deposits. The containing material may be too loose to safely mine by turning the river, and panning is the simplest technique to extract the gold.

According to Longridge's (1902) other manual of nineteenth century mining, in panning, some mined ore is placed in a large metal pan, combined with a generous amount of water, and agitated so that the gold particles, being of higher density than the other material, settle to the bottom of the pan. The lighter ore material such as sand, mud and gravel are then washed over the side of the pan, leaving the gold behind. Once a *placer* deposit is located by gold panning, the miner usually shifts to equipment that can treat volumes of sand and gravel more quickly and efficiently. The same principle may be employed on a larger scale by constructing an inclined sluice box, with barriers along the bottom to trap the heavier gold particles as water washes them and the other material along the box. This method better suits excavation with shovels or similar implements to feed sediment into the device. Where water under pressure is available, water under pressure may be used to mine, move, and separate the precious material from the deposit; this is called hydraulic mining (Figure 6-1).

The hydraulic mining is so destructive that it was virtually abolished after the nineteenth century in the world. In the *Lavras do Abade* mine this was also the main reason for the conflict between the villages. According to Wagenen (1900) in another manual of nineteenth century mining and Bowie (1898), hydraulic mining is a form of art that employs water under pressure to dislodge rock material or move sediment. This form of mining was first used by Edward E. Mattison in Sierra Nevada, California, in 1852, to exploit gold-bearing upland paleogravels. However, previously hydraulicing technique had been invented by the Romans, the *ruina montium* (razing of the hill), to find gold using high-pressure water jets from a tank situated from 400-800 feet above the ground. In the case of *Lavras do Abade*, the utilization of hydraulic elevators or aqueducts was also necessary because the nearest water source for the mining area is the *Abade* waterfall, and it did not have the fall necessary to power the hydraulic machine (Figure 6-2).

Hydraulic mining became the largest-scale, and most devastating, form of *placer* mining in the nineteenth century. Wagenen (1900) and Bowie (1898) explain that the water

was redirected into an ever-narrowing channel, through a large canvas hose, and out a giant iron nozzle (mechanical device designed to control the characteristics of a fluid flow as it exits from an enclosed chamber into some medium), or monitor (Figure 6-3). The extremely high pressure stream was used to wash entire hillsides through enormous sluices. However, Crouch (2001-2004) explains that in 1884 hydraulic mining was prohibited by federal injunction in California, USA because of the massive volume of debris that clogged the streams. Curiously, it was also precisely in the same year of 1884 that a “similar” hydraulic machine was implanted in the *Lavras do Abade* mine, Mid-Western Brazil, and the consequences of its operation are discussed next (Figure 6-4).

Mining Exploitation and Environment

The primary environmental effects of hydraulic mining are river sedimentation and turbidity, followed by the high metal contamination. According to Kelly (1998) the environmental impacts associated with mining are largely confined to regions in the vicinity of the appropriate geological formations and downstream of the catchment. However, it is not only the extraction of the mineral which produces pollution, but also its disturbance for 50 or 100 years after the cessation of mining still polluting the water draining out of disused mines and spoil heaps.

Environmental activists describe hydraulic mining as being an environmentally more destructive type of mining because of the large amounts of silt that it adds to previously clear running streams. Water that was diverted to dry land created a boggy mud that destroyed habitats and flooded the land of farmers living downstream. Environmental issues can also include erosion, formation of sinkholes, loss of biodiversity, and contamination of groundwater by chemicals from the mining process and products.

According to Hadley and Snow (1974), mining pollution generally affects all biospheres from the soil to the air, but the element most affected is the water resources of a region. Kelly (1998) also exposes that processing the ores produces the largest amount of contaminated water, because water is both a vital raw material for and a major waste from several of these process. The contamination includes the chemical reagents such as mercury that are added to separate the minerals from the finely ground rock by flotation. In sequence, an excess of flotation reagents and colloidal and supercolloidal minerals are then discharged on the milling effluent. As a result, slag heaps still contain considerable amounts of metals leached in the water for many years after mining has ceased. This pollution procedure for

amalgamation of gold with the use of large quantities of mercury also employed in the *Lavras do Abade* was called the *patio* process.

According to Miller and Lechler (1998), the mercury amalgamation has been used by Roman smiths for refining gold since ancient times, but was only in 1554 that mercury was used on an industrial scale in Mexico. The *patio* process was so efficient at refining large volumes of low-grade ore, that its utilization continued nearly unchallenged through the end of the nineteenth century. Unfortunately, it also led to the release of unprecedented amounts of mercury to the environment, particularly in North, Central and South America. With the advent of the cyanidation process in 1890, the mercury amalgamation was largely replaced in most temperate environments, but it continues to be widely used by non-organized prospectors of the tropics.

In the *patio* process the ores were crushed (typically either in *arrastras* or stamp mills) to a fine slime which was mixed with salt, water, *magistral* (essentially an impure form of copper sulfate), and mercury, and spread in a one- to two-foot thick layer in a shallow-walled, open enclosure or *patio*. Horses or mules were driven around on the *patio* to further mix the ingredients, and, after weeks of mixing and soaking in the sun, a complex reaction converted the gold ore in the native metal, which formed an amalgam with the mercury and later is purified with heat treatment. The principal pollution effect of the *patio* process is the metal concentration in the environment.

Kelly (1998) also explain that the *placer* mining is the most “visible” type of mining pollution, because the net effect that causes disruption of the surrounding area as well as direct environmental consequences on the streams. The effects include turbidity in the water as a result of runoff and washwater contaminated by silt and clay, which increased sedimentation, filling interstices between gravels silting the channel. Consequently the deposits sediments can act as a barrier to free movement to the stream. On the other hand, the metals transferred to the stream sediments cause a range of physical, chemical and biological process over time, not entirely studied.

Metal Concentration and Environment

According to Kelly (1998) the best way to study the metal concentrations in the environment is measurement with techniques of filterable and particulate fractions.⁸⁸ Therefore, according to Miller and Lechler (1998), there are important particularities concerning the geographical and temporal trends in the metal concentrations and varying grain size. In this way the historical deposits are better, because of the enrichment of trace metals in fine-grained sediment of most aquatic systems during long periods of time, different from modern channel bed sediments.

The measurement of mercury concentration is a key factor for determining the level of mining pollution in a region, but its identification in the field is not an easy task. Miller and Lechler (1998) also explain that mercury in the form of cinnabar is associated with mining and milling debris where sulfide ore bodies are being worked. On the other hand, in the amalgamation process mercury has the potential to be transported as liquid droplets, and as a combination of mercury and gold particles. The three forms of mercury are associated with the coarse-grained fraction of alluvial deposits.

However, Miller & Lechler (1998) note that the problem of measurement in the amalgam particles lies in considering that the densities of mercury (13.23 g cm³) and gold (19.28 g cm³) have the potential to be hydraulically separated in similar sizes. In this way, they conclude that the better methodology for the measurement of mercury is the spatial (downstream) trend to trace metal concentrations and comparing data collected from similar depositional sites.

For example, Fearnside (2005) presents a curious case of heavy metal contamination and the perpetual danger that this type of metal can cause to the human population. The author discusses a case study about mercury pollution in a dam construction in *Rondonia* state, Brazil. The Amazon soils flooded by the dam reservoir contain mercury from natural sources millions of years old which have been gradually accumulating from deposits in rain and dust from volcanic eruptions and other sources around the world. In this way, the anoxic conditions at the bottom of a reservoir provide the environment needed for methylation of

⁸⁸ In the filterable technique the water sample passes freely through a filter pore of 0.45 µm, to that the particulate material that includes not only solid minerals and crystals of the metal but also metals absorbed onto humic acids and other surfaces been collected.

mercury, which increases in concentration by about tenfold with each link in the food chain from plankton to fish, up to people who eat the fish.⁸⁹

As another example, Harrison and others (2003) present the pollution of mining sites since 1920 in Australia, the researchers employ a series of measurements of core and surface sediments to describe the pollution process in the rivers of the region. According to Harrison and others, little has been done to prevent run-off and sediment transport from the mine and processing sites since the cessation of mining. In this way, a 100 years of temporal record pollution fluctuation in the downstream of the mines and around sites was determined. Harrison and others found heavy metal concentrations, including lead, arsenic, zinc, copper, cadmium, mercury and silver in both core and surface sediments.

The same conclusion is reached by Adams and others (2007) with studies about the pollution of an ancient pyrite mine in the state of Massachusetts that was operating between 1882 and 1911. The authors used the previously described methodology to catch the sample: surface water and groundwater were filtered using 0.45µm filters. After the cations (Na, K, Ca, Mg), transition elements (Fe, Cu, Mn, Zn), silicon (Si) and other indicator species (Al, Pb) were measured using a spectrophotometer, while the anions (Cl, SO₄, NO₂, NO₃, F, Br, PO₄) were determined using a chromatograph. In conclusion the study determined that the mine water discharged is constituted of pollutant loadings and a mass remaining material. The pollution will continue to flow into the environment for many decades unless abatement measures are implemented today at the site.

In summary, the general study of old pollution mines is used today as a predictive model for future mining exploitations, such as the work of Adams and Younger (Adams & Younger, 2000; Paul L. Younger, 2000) based in computer simulations of water compartment and models of pollution mining. However, Banks and others (1997) present many techniques for recovering water sources affect by the mining impacts with a basis in the geochemistry in the alkaline and acidic mine-water deposits. Therefore the main problem caused by old mining exploitations is the long-term effect of heavy metal concentration in the environment (Grimalt, Ferrer, & Macpherson, 1999; P. L. Younger, 1997).

⁸⁹ "The maximum concentration of total mercury in fish considered safe for human consumption in Brazil was 0.5 mg/kg fresh weight until 1998, when the criterion was revised upward to 1.0 mg/kg fresh weight"(Fearnside, 2005:13).

Archeo-Environmental Research in the Pireneus Mountains

The previous two segments presented the physical and historical characteristics of the *Cerrado* biome as an environmental background to this research, while the mining impacts are explained through techniques applied in the nineteenth century and its pollution legacy. Otherwise, the historical *eco*-archaeology research in the *Pireneus* mountains area and surroundings show some other patterns of anthropic interference and ecological response besides the one specific mine pollution by heavy metals in the *Almas* river.

Fieldwork and Soil Analysis

The remains of heavy metal presence in the area were collected through soil samples from the archaeological site of *Lavras do Abade* up to *Pirenópolis* city, following the course of *Almas* river. The methodology employed was shallow excavation with a trowel to approximately 10 cm below the ground surface. All soil was collected in plastic bags with UTM references by GPS attached and the samples were then dried in sun light for eight hours to eliminate water residue.

The first point of collection was inside of the foundry building of the archaeological site. The CP-01 point did not present a dense vegetation, with the soil compounded of sand with a brown color and without gravel. The second point of collection was in the beginning of the mine area, next to the gate of water. The CP-02 point presented a dense vegetation and soil formed by much gravel with sand in a brown-yellow coloration. The third point of collection was in the middle of the mining area, next to the exploitation walls. The CP-03 point also presented closed vegetation with gravel and sand forming the soil with clear brown-yellow coloration. The fourth point of collection was at the end of mining area, inside of the *patios*. The CP-04 point presented a disperse vegetation, with the soil compounded by small gravel and sand with brown-red coloration.

The fifth point of collection was in the beginning of *Barriguda* creek, in one sandbank at the creek's margins. The vegetation of CP-05 point was less dense than inside of the mine and the soil almost compounded of sand in a brown-red coloration. The sixth point of collection was in the middle of *Barriguda* creek, next to the water supply and distribution of the city of *Pirenópolis*. In the CP-06 point, the vegetation was dispersed and the soil characterized by humid sand with exposed matrix rocks, and brown coloration. The seventh point of collection was in the beginning of the *Almas* river and end of the *Barriguda* creek.

The CP-07 point did not present dense vegetation but small plants, with red colored humid sand soil, and exposed rocks.

The eighth point of collection was at a beach of the *Almas* river in the beginning of the city. The CP-08 point did not present any vegetation and the soil was compounded by brown-red sand with some exposed rocks. The ninth point of collection was in the *Almas* river, next to the building constructions in the middle of the city. The CP-09 point presented small vegetation with the soil in brown-yellow coloration and formed by humid sand with big exposed rocks. The tenth and last point of collection was in the *Almas* river, below a road bridged in the end of the city. The vegetation in the CP-10 point presented as dense, with a brown soil compounded by sand and small disperse rocks.

Dr. Carlos Alexandre Borges Garcia and his team analyzed the soil samples in the environmental chemistry laboratory of the Federal University of Sergipe. The methodology used was the determination of heavy metals concentration through the dissolution of the soil samples in acids and measurement of product in a spectrometer of atomic absorption (Alves, Garcia, & Xavier, 2006). Following this, the heavy metal concentrations were calculated according to the mass of soil collected, and the result of this was compared with reference values to soil pollution in Brazil (CETESB, 2005).

The first point of collection presented a mg/kg concentration⁹⁰ of 19,99 copper (Cu), 15,98 zinc (Zn), 4,49 lead (Pb), 4,16 nickel (Ni) and 0,04 mercury (Hg). The second point of collection presented a mg/kg concentration of 22,95 Cu, 16,49 Zn, 3,49 Pb, 4,49 Ni and 0,05 Hg. The third point of collection presented a mg/kg concentration of 6,99 Cu, 11,48 Zn, 2,50 Pb, 5,49 Ni and 0,04 Hg. The fourth point of collection presented a mg/kg concentration of 6,50 Cu, 18,49 Zn, 2,50 Pb, 8,49 Ni and 0,02 Hg. The fifth point of collection presented a mg/kg concentration of 4,00 Cu, 11,50 Zn, 2,00 Pb, 6,00 Ni and 0,01 Hg. The sixth point of collection presented a mg/kg concentration of 3,49 Cu, 9,98 Zn, 2,00 Pb, 4,49 Ni and 0,01 Hg. The seventh point of collection presented a mg/kg concentration of 2,99 Cu, 7,48 Zn, 1,00 Pb, 2,49 Ni and 0,01 Hg. The eighth point of collect presented a mg/kg concentration of 3,00 Cu, 9,00 Zn, 1,50 Pb, 2,00 Ni and 0,02 Hg. The ninth point of collection presented a mg/kg concentration of 6,00 Cu, 8,00 Zn, 2,50 Pb, 3,00 Ni and 0,02 Hg. Finally, the tenth point of collection presented a mg/kg concentration of 5,00 Cu, 9,50 Zn, 3,00 Pb, 3,50 Ni and 0,03 Hg.

⁹⁰ Mg/kg is a typical chemical unit to measure parts per million, or the quantity of milligram concentration of one substance or solute in the kilogram concentration of other substance or solution.

According to Technological Company of Environmental Sanitation of São Paulo State (CETESB, 2005), the quality reference value or VRQ is a concentration value of determined substance in the soil or in the subsoil water, which define clean soil or natural water. The VRQ is statically interpreted according to physic-chemical analysis from diverse soil and subsoil water samples. The VRQ must be used as referential to actions of soil and subsoil water pollution prevention and control of contaminated areas. In the case of *Lavras do Abade* and *Pirenópolis* study area, no concentration was superior to the VRQ indices mg/kg of 35 to Cu, 60 to Zn, 17 to Pb, 13 to Ni and 0,05 to Hg.

Heavy Metal Presence in the *Almas* River

Notwithstanding, the Cu, Zn, Pb, Ni and Hg concentrations in the area of research can also indicate others patterns beside the old mine pollution to be studied. The copper presented one concentration three times more in the CP-02 and CP-01 than in the other eight points of collection. The copper distribution in these two points can be interpreted as directly associated with gold, both forming a rich ore deposits in the area of *Lavras do Abade*. On the other hand, the pattern established between the distribution of copper in the CP-03 and CP-04, and in the CP-09 and CP-10 can indicate other gold ore deposit in the area of *Pirenópolis* city. Somewhat similar to the copper distribution, the zinc also presented a pattern concentration that indicates its presence one third more than the others in the CP-04, CP-02 and CP-01. The zinc concentration in the area of *Lavras do Abade* site can also be indicative of the ore composition with gold, while its distribution in the others points of collection was stable and with little increase.

The lead also presented a similar distribution as the copper and zinc, and it was concentrated in the CP-01 and CP-02 of *Lavras do Abade* site, presenting a gradual decay until CP-07. However, the lead also displayed an increase from CP-08 to CP-10, which can be compared with the copper distribution in the area of *Pirenópolis* city. Like the copper and zinc, the lead is also present in the composition with gold as ore deposit. On the other hand, the nickel distribution was different from the other minerals; its concentration occurs only in the CP-04 point and later it is distributed around the CP-05 and CP-03. Other highlight element about the nickel is that this metal also occurs in the form of ore deposits associated with gold such as copper, zinc and lead, but the nickel distribution in the area between the *Lavras do Abade* site and *Pirenópolis* city was atypical.

Finally, the mercury distribution follows the copper, zinc and lead distribution with a concentration in the CP-01 to CP-03 in the *Lavras do Abade* site. Next, the mercury decayed until the CP-07, when it has an increase among the CP-08 to CP-10 in the *Pirenópolis* city. The mercury is an intrusive element, and is not associated with the native gold ore deposit in the areas. In the same way, mercury is a clear indicator of anthropic actions to the gold extraction. Consequently, the presence of mercury in the *Lavras do Abade* site, and in *Pirenópolis* city lies a clue to gold exploitation in both areas. However, the mercury presence is historically explained not only by the *Almas* river pollution, at a time that the mercury concentration in the CP-06 is almost null; but also by the historic gold exploitation in the *Meia-Ponte* village- today *Pirenópolis* city.

In terms of the soil contamination in the area of research, it is clear that the impact was not only in the soil itself, but also in the atmosphere, hydrosphere and surrounding biota. Similar to the *Lavras do Abade* case, Silva et al. (2004) present a problem of heavy goldmine metal pollution in *Minas Gerais* state, in southeast Brazil. In this mine Cd, Cr, and Pb were not identified in the soil, although there were high concentrations of As, Fe and S, medium concentrations of Zn and low concentrations of Cu and Ni. Silva et al. conclude that there are a huge potential to future acid drainage, by the combination of this elements and consequently contamination of soils, water sources and all food-chains.

According to Guilherme and Marchi (2005) the heavy metal analysis in the soil is the identification of trace elements that are not naturally present in the environment. However, the elevation of determinate trace elements in one area can be the result of anthropic and non anthropic interferences. The natural process could include, for example, rock decomposition, while the anthropic pollution is many times associated with mining and industry activities. Guilherme and Marchi also alert that some trace elements are biologically necessary, while others not; however any essential trace element in specific concentrate conditions can cause irreversible damages to the environment.

As an example, Guilherme and Marchi (2005) note that the copper is essential to all living organisms in the transport of oxygen, but its concentration can also present moderate to high toxicity level for plants and moderate toxicity for animals. The zinc, similar to copper, is also essential to all living organisms, but in concentration, it can present a low to moderate toxicity for plants and the same for animals. Otherwise, lead does not have illustrated a function to living organisms, and its concentration can present a moderate toxicity for plants and high toxicity for animals. While nickel presents a function to plants but does not have a known function to animals, in concentration it can present a moderate to high toxicity for

plants and a moderate toxicity for animals. Finally the mercury does not have a known function to any living organism, and its concentration can present a high toxicity for plants and animals.

Environmental Sensibilities or Mining Patterns

According to Semerene Costa (1995) the conflict between the village and the company over the use of *Almas* river was a resulted of socio-environmental impacts of gold exploitation and relationship between the local population and the natural world. Semerene identifies this as “environmental sensibilities” or the exploitation of natural resources and the representation of *Almas* river in the organization of local society. According to Semerene, the population of *Meia Ponte* was prevented from doing carrying out their basic necessities in the river because of pollution of the water by mining. This generated conservationist environmental sensibilities and affected the local mechanisms of power.

Semerene is strongly biased toward ecological history, failing to consider alternatively explanations such as economic and political factors in benefit of only environmental aspects of the conflict. Despite the use of primary sources, the work minimizes economic and political aspects in benefit of environmental aspects only. Notably, no ecological studies are introduced to support his conclusions. Semerene’s contribution is mainly the study of “environmental sensibilities” in the nineteenth-century Brazil and the relationship between the company and the population. Second is the inquiry about the contradictory attitudes of *Meia Ponte* population for the destruction or preservation of natural resources, and the relationship with the river.

In terms of historical mining impacts and the environmental consequences, the work by Isenberg (2005) is a complete descriptive environmental history of mining in California during the nineteenth century. First, Isenberg discusses the environmental, economic and social transformations that the hydraulic mining made in the region of the Sierra Nevada in California. Isenberg illustrates many examples of enterprises and the technology employed in these transformations; to the author the hydraulic mining was not only responsible for the mercury and mud pollution of water sources and surrounding areas, and consequently population diseases, but was also the principle means of industrialization of the West. As an example, Isenberg explains that the technology developed to deliver water to the hydraulic mining in the Sierra Nevada was lately responsible for the supply of water to many Californian cities.

Following this, Isenberg (2005) presents that the urban development of cities (initially villages) was associated with hydraulic mining expansion. The cities, in close relationship with the rivers in the region, worked as commercial centers for the miners, while the same cities suffered from constant pollution and floods, which caused diseases that affected entire populations. With these dilemmas, the cities lived in a constant dichotomy with the mines; on one hand, they were economically and productively dependent on the mines, and on the other hand, they were sanitarily affected by the mine dejects. As an example, the author recounts the flood of 1850 and the cholera epidemic that affected the population of Sacramento village as a result. Finally, Isenberg explores the wood forest used by the miners, first as the main fuel resource and later as primary construction material. In another example, Isenberg shows how the legal battle of the miners to access the redwood forest, after they had drained all wood resources in the Californians mountains and valleys, is another critical fact illustrating the constant modifications that resulted from sawmill technology, and the dangerous impacts of this kind of industry. In conclusion, Isenberg presents the large-scale modifications of the environment that the mills and mine have provoked as the population grew and the timber exhaustion as an obvious consequence.

Isenberg's (2005) work is a complete example of technological modifications and environmental consequences due to the mining exploitations, in more specific terms, to the consequences of the hydraulic mining endemic to gold exploitation. However, the historical ecology approach does not present a clear signature in this human action and nature response relationship, because Isenberg does not, like Semerene, explore the dialect present in this relationship. In this way, similar in content, but different in method, this study presents the historical ecology approach of historical landscape to understand not only the environmental impacts of gold exploitation in the *Lavras do Abade* site, but also the construction of a memory-place that is reflexive of human actions and natural responses.

Consequently, the *Lavras do Abade* site and *Pirenópolis* city divided not only a history of conflict and abuse of natural resources, but also one symbioses existence with the *Almas* river. The symbiosis existence is represented by the similar levels of heavy metal (mainly mercury) deposits in both areas of *Almas* river, but with absence between. In this reason it is possible to affirm that there not are environmental indication of one mine pollution, but two historical mine pollutions, one by the *Lavras do Abade* mine in the end of nineteenth century and other by the *Meia-Ponte* village only in the eighteenth century. Despite both levels being below today's pollution indices, it is necessary to refer to the period in that both mine activates were executed. Following this thought, it is also valuable to observe that the

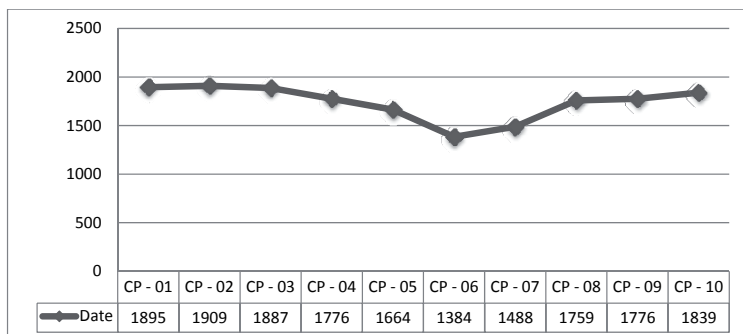
mercury level decays at a rate of approximately 33.3% in each point, and that this decay corresponds to one hundred years old difference for each gold mine extraction activity.

It is not my intention now to suggest major interpretations about this fact, but it is also necessary to present the evidence and try to correlate this with the pollution study. What is first conclusive is that there is one apparently decreasing pattern of 33% of mg/kg mercury concentration in the area of study to each one hundred years of goldmine exploitation. The *Lavras do Abade* site presents an increase of 33.3% more mercury than *Pirenópolis* city, and by its turn the *Lavras do Abade* site has 33.3% less mercury than the VRQ pollution indices to today. In the same way, the time space between one gold exploitation and another in the study area is approximately one hundred years, while it is the same time space between the last gold exploitation in the area and today pollution indices.

Concluding, I propose the follow formula to determine the date of historical-archaeological mining sites according to the measurement of mercury concentration in the area. Where T is the subject of the formula, T_0 is the variable of date that the collect was made, N_0 is the variable of highest mercury concentration in T_0 or the Hg pollution indices to the area, N_v is the variable of amount of mercury concentration in any the point of collect studied, and C is the constant to the mercury decrease to the specific area, which is of 1/3 to each 100 years.

$$T = T_0 - \frac{(Hg \frac{Mg}{Kg})N_0}{(Hg \frac{Mg}{Kg})N_v} x C(\frac{1}{3} x 300)$$

In light of this it is possible (and maybe probable) to affirm that the rate of decrease of mercury in a goldmine exploitation area is of 1/3 to each one hundred years. In addition, this pattern can be used as archaeological dating method for historical mine sites or as predictable model for the remediation period of mercury pollution; and it is also a striking environmental example of natural response to the environmental degradation caused by humans in the area.



Therefore, other variables also could explain these mercury patterns in the area of *Almas* river, such as the intensity and duration of gold exploitations. Because on one side, we have the industrial mining of *Lavras do Abade* village with duration of approximately only five years, but, with a high intensity in the gold exploitation. And on the other side, we have the artisanal mining of *Meia Ponte* village with more than 50 years of duration, but, with a low intensity in the gold exploitation. In combination or not with the temporal scale, these factors are also variables that can lead to the mercury patterns shown in the collected soil samples of the area. However, independently of what variables (temporality, intensity or duration) was the main responsible for the gradual mercury accumulation in the *Almas* river, is indisputable that, mining pollution was and is a important impact factor to all societies.



Figure 6-1. Sluice box / Undercurrent – (Philermon, 1883).

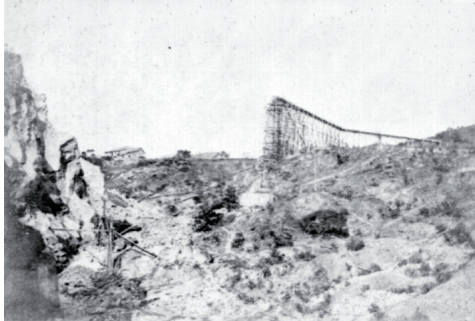


Figure 6-2. Elevator to water box – (Philermon, 1883).



Figure 6-3. Water box and hoses – (Philermon, 1883).



Figure 6-4. Hydraulic dismount – (Philermon, 1883).

CHAPTER 7

CONCLUSION

Vestiges of an Environmental Conflict

The archaeological research of the *Lavras do Abade* site did not identify any conflict pattern in the stratigraphic units. Besides using extensive bibliography on the subject, the archaeological interventions conducted on the site did not localize any vestige that could be associated with the fight that occurred in the place in 1887. The selection of the areas, such as household, commercial and industrial units was based in the historical documentation studies, which appointed the chosen buildings as the mainly affected sites targeted by the assault to the mine village. Otherwise, the option to do test pit excavation types of 1x1 meters, inside and outside of the structures, was directed to obtain comparative samples of both areas. In the case of a conflict area, the principal objective was localized and interpreted through the patterns associated with assailants' movements, such as the dispersion of bullets and cartridges.

In the case of the *Lavras do Abade* site, the use of metal detectors was not possible to locate bullets or cartridges associated with the conflict, because of the high metal concentration in the area due to the goldmine. Given this condition, the most commonly applied methodology in battlefield sites needs to be discarded, since the archaeological survey was only conducted in traditional style. A second element that was also absent in the archaeological vestiges of the *Lavras do Abade* site was human bones. The discovery of human bones, besides their recovery from burial site areas, are also the best indicator of conflict sites. Unfortunately, in the *Lavras do Abade* site none of these vestiges were found that could serve as an undeniable proof regarding the fight between the villages during that period.

Therefore, the *Lavras do Abade* site acts today as a memory-place to the living community of *Pirenópolis* city. The references found not only in the historical documents, but also in the residents' oral history and memory, are clear testimonies of the conflict that had occurred between the villages in 1887. The preliminary and exploratory condition of the archaeological excavations conducted and presented in this work, also emphasize the necessity for broader research about the topic and the place.

In contrast, the material culture recovered from *the Lavras do Abade* site provided valuable information about the mining feature systems employed, the consumption choice and the social representation of the objects, as well as the building structures and spatial organization of the mining village. According to current literature in mining archaeology, the mining sites could be classified as spaces that despite their monumental scale, based on three distinguished spheres of knowledge: material, population and information. In the *Lavras do Abade* site all three spheres are recognizable.

Firstly, the material sphere of the site can mainly be identified through the technology employed in the mine. The installation of the CMG Company in 1880 brought to the mine a corporative vision of gold exploitation. The transformations in landscape such as diversion of streams and the waterfall, implantation of flumes in wood and stone, and the hill dismount by the hydraulic machine, were the most significant. Today, the environmental impact of these actions is alive, as are the archaeological and environmental testimonies that populate the *Lavras do Abade* site.

Secondly, the population sphere is represented by the village itself, and the history of conflict that is attached to this place. Definitively the type of occupation planned for the *Lavras do Abade* village was not a temporary settlement, but the establishment of households. The best example which notes the urban planning program of the mine village is the administration house. The Arena house is a perfect combination of administrative office and domestic household; the materials used in its construction (roof tiles and glass windows) are clear elements of ostentation. On the other hand, the activities perpetuating inside the house combine many different mining activities, such as: residence, production and power control.

Thirdly, the information sphere is also visible in the material culture from the *Lavras do Abade* site. As an ideological component in modern archaeological mining sites, the capitalistic mentality could be noted through the study of material culture in Western societies. In this way, the recovered ceramic, glass and metal from the present site, not only the economic aspects of a mining village at the end of nineteenth century mid-western Brazil, but also its social aspirations. In addition, subjects as class and gender also can be inferred through the materiality, in these cases the social segmented areas represented by the context of the finds.

Finally, the feature system applied in the *Lavras do Abade* mine is characterized by its autonomy and isolation, and can be defined as an industrial island in an extractive landscape. Autonomy, in consequence of the technology employed in the gold exploration, which was

monumental in scale, produced a boom-bust economic exploration in the area. Isolation, as a result of the productive options taken by Alfredo Arena and the CMG Company, had no regard for the indiscriminate use of valuable environmental resources such as in the case of the water pollution issue.

Building Structures of the *Lavras do Abade* Village

The building structures of the *Lavras do Abade* site could be subject to many interpretations, but instead of making a deep architectonic analysis, it is necessary to also consider the social context. According to Hicks and Horning (2006), while descriptive approaches continue to dominate many studies about building remains, interpretive efforts have led historical archaeologists to formulate the “Georgian Order.” This building archaeology has placed the focus on domestic sites and today incorporates the vernacular, industrial, agricultural gardens, prisons, hospitals and many other structures. The central aspect of this field of study is the close relationship between people and buildings, aiming to distinguish the ethnic architectural types, and the everyday material lives of each member of a household. In the case of the *Lavras do Abade* village, despite the historically known functionality of each building, the social space is also built brick by brick.

The objective of this school is the observation of how the meaning of both objects and buildings change from one situation, period or perspective to another, and how the assemblage, change, creation and destruction of buildings create life-histories. These life-histories of buildings are dispersed both over time and space, and are mainly present in reused remains of earlier structures. In the case of *Lavras do Abade*, the “life-history” of remaining structures is clear, not only at the archaeological site, but also in *Pirenópolis* city today where many building elements such as glass windows, ceramic roofs and wall stones were reprocessed to construct new houses. For instance, an element that was recurrent in this recycling process of reused artifacts from the mine, was the metal pipes of the mining hydraulic machine, which after being plundered from the village, were used as chimneys in many houses of the ancient *Meia Ponte* village.

Besides approaching the *Lavras do Abade* structures with the domestic archaeology paradigm, it is also my intention to observe “lifestyles” and the social construction of household spaces. However, according to King (2006) it is difficult to define if a household is a primary social unit of class, gender and ethnicity, or a small-scale of larger social and cultural phenomena. In another view, the household could be related to the life cycle of

individuals, but to do this work it is necessary to identify individuals in their archaeological record, which is not such an easy task. Following King, the site context is the key, particularly contexts about the practices defined through material and documental sources; while another step is always an internal, rigorously organized, temporal and spatial structure of excavation. In the *Lavras do Abade* buildings, the social context is clearly identified in the constructive materials studied. In this case, the exclusivity of certain items, such as “golden” roof tiles, point directly to this segmentation.

In the *Lavras do Abade* case study, the historical documentation (written and pictorial) was the key element to identification and interpretation of the structures (Figure 7-1). Nevertheless, the application of Prince and Deetz's photographic methodology in previous research at the *Lavras do Abade* site did not reach more conclusive results. The excessive vegetation did not permit a correct identification of structures and places in the site through pictures. However, a step forward in these historical sources was attributed to digitalized data of the buildings to create a virtual model of the site (Figure 7-2). The virtual model helped with the projection and selection of planned archaeological interventions on the site, and later with the composition of data and spatial analyses of the vestiges.

In a very moderate way, the *Lavras do Abade* virtual model could be used as a knowledge base towards the construction of an expert system in which the objective applies simulations to the site. According to Gardin (1988), the expert systems are divided into two types, the knowledge base and the inference system. The knowledge base, which is the proposal here, covered two kinds of domain: the factual knowledge and the operational knowledge. In the case of factual knowledge, the *Lavras do Abade* virtual model could be used as a collection of scientific data about the site, where the applicability of hypotheses is guaranteed through the possibility of computer simulations. On the other hand, as operational knowledge, the *Lavras do Abade* virtual model could also serve as a depository of inference rules, where in combination with the factual knowledge, produce scientific constructions. In both cases, this dual structure enables the application in the *Lavras do Abade* virtual model of computer simulated rules, to the historical archaeological facts. However, these archaeological constructions as defined by Gardin, are not the intention of this work for now, but probably could be in future research.

Historical Landscape of the *Lavras do Abade* Site

As an important part of the site, the study of the landscape requires a general understanding and practical application of particular concepts. The *Lavras do Abade* historical landscape is interpreted according to the framework of the anthropological spatial theory. According to De Cunzo and Ernstein (2006), it was Terrence Epperson who applied a Foucauldian perspective to a built environment as its better example. The panoptic concept of constructed surveillance⁹¹ changes the normative view of “spaces of constructed visibility,” and introduces the notion of spatial modern discipline.

Similarly, in the *Lavras do Abade* site, the spatial discipline was represented in the dispersion of buildings, and in roads and stone walls. The mine was a restricted, built environment in which the centralized management building controlled the work and living spaces of the miners. The urban plan of the village concentrates on the essential productive aspects of the mining, such as the administration house and the foundry in the center. The space between the goldmine and the miners' houses was also occupied by the Arena's house. The roads were parallel and also segregated the public and private spheres, keeping the common services, such as canteen, factory and store in the middle, while the residences were disposed in the periphery. The protection and contention were also relevant issues, with two big stone walls and gates closing the only accesses to the *Lavras do Abade* mine and village.

In the *lato sensu*, the *Lavras do Abade* historical landscape can also be understood as a capitalist urban space. According to O'Keffe and Yamin (2006), the first difficulty of urban archaeology is that cities are vast archaeological sites and their urban landscapes extend across hundreds, and often thousands, of square miles. Secondly, almost all cities established post-1500s are still occupied, and this continuous occupation generates deep stratigraphic records. However, historical archaeology has contributed to the study of the local and global architecture, the elite and vernacular architecture and their associated cultures. In the *Lavras do Abade* village, the use of parallel streets was innovative to the period, during the time that the majority of Brazilian towns in the period followed the Portuguese colonial urban patterns. Constructive technology also separates the *Lavras do Abade* village from others around, because the combination of wood framework and stone covered structures were not similar to the adobe buildings produced in the same period.

⁹¹ Foucault establishes the “Panopticon” as a surveillance system that centralizes power and controls prisoners, patients, students, and workers inside of its structures. (Foucault, 2008:165-179)

To resume, with the conjunction of buildings and urban planning, the *Lavras do Abade* site could be considered a germ of an industrial town; in this case, a discussion of the field of urban archaeology is also justified, but carefully applied. The notion of space and time in the *Lavras do Abade* site is less significant than the current archaeological investigations in other cities, but the same notions of theoretical and methodological approaches can be employed. To O’Keffe and Yamin (2006), the city is primarily a “theatre,” and in this concept the built space is not examined only as an artifact, but as an active stage that is involved in the performance of social life. In the case of industrial cities, the new or redesigned urban landscapes were no less formal than those of the sixteenth century, or the regulation is the same as in the formality of the Renaissance period. Meanwhile, O’Keffe and Yamin expressed that these thoughts are present in European cities, while the *Lavras do Abade* village provides an example of gem to industrial city but with other understandings.

According to Symonds and Casella (2006), the archaeology of industrial spaces today works with paradigms from ‘interpretative’ and ‘post-processual’ schools, such as power and inequality, labor relations and class formation, and social aspects of resource exchange. In the case of mining sites, the industrial archaeology and in a broad sense, the industrial capitalism study looks for everyday lives of entrepreneurs and employees, which shaped the cultural landscape by the “bourgeoisie and proletarian” relations. The *Lavras do Abade* was also a fertile space for these conflicted relations, conducted internally among the manager and workers, and externally among the miners and farmers. Conflicts can also be better understood through the study of environmental impacts provided by the mining pollution in the *Pireneus* Mountains.

Ecology and Memory of Mining Pollution

In the case of *Lavras do Abade*, ecological anthropology and environmental history were not the best approaches. First, because the study of gold area exploitation is not about the transformation of the environment to human adaptation, but rather the degradation caused by the indiscriminate human use of the space. Second, because the archaeological and ecological site analysis is not about the historical formation of the environment, but instead concerns the modern relationship between the mining pollution heritage and the living community memory discourse. As such, historical ecology and archaeology research is one of the best modern approaches to “yesterday’s” problems.

Greenberg and Park (1994), who expose the necessary inclusion of cultural and political activity within an analysis of ecosystems that are socially constructed. In the *Lavras do Abade* site, the destruction effects are more than notable, they are part of the landscape; with this “social ecology” analysis the contemporaneous is more than absorbed, it is the execution of a modern capitalist view above the natural resources. The *Lavras do Abade* event was cause and consequence of a “newly born” industrial society in the nineteenth century, as well as a small change in this history, because of the option that was adopted with the conflict.

Consequently, the *Lavras do Abade* site is not only a hotspot of ecological studies about the mining environmental degradation in mid-western Brazil, but also a fertile record of historical modifications conducted by the raising of modern industrial society in nineteenth century South America. In this environment is fixed the remains of historical pollutions from the times of world capitalist spread and the local reactions to the natural transformations during the period.⁹² In this way, the mercury pollution of *Lavras do Abade* had also been a factor of contribution and study to the formation of Anthropocene.⁹³

As a consequence and as appointed by Whitehead (1998), the environmental study of the *Lavras do Abade* historical landscape was made more in the “regressive term than in the retrospective term”. In other words, the study sought to understand the past ecologies that produce the present ones, and not only the processual response that the past ecologies had to the past changes. However, this objective is only reached if engaged in a series of anthropological and historical issues, which combine different perspectives to ecological themes. The *Lavras do Abade* site provides this condition, given that the water was polluted for more than 250 years and this time frame proportioned a temporal scale to the historical and ecology approach, as well as the production of a collective and cultural memory about.

Besides the historical and ecological studies of human impact on historic periods, there are several suggested causes including human influenced catastrophes (Bawden & Reycraft, 2001); the dialectical relationship of humans and nature in historical landscape construction seems relevant to understanding the environmental impacts that have occurred in the *Lavras*

⁹² “It is somewhat surprising that paleopollution study has remained an unexplored toll in the field of archeology” (Nriagu, 1996:224).

⁹³ “So far, little attempt has been made to “read” the geochemically archived records to determined the pattern of dispersion and deposition of such massive quantities of Hg at the local, regional or global scale” (Nriagu, 1996:224).

do Abade. The dialectical concept of historical landscape is not merely a connection between humans and nature but an intricate heterarchical system of power dispersion.⁹⁴

Social Memory and Capitalism Legacy

Consequently, it is not the intent of this research to interpret the historical landscape only in a strictly evolutionist view, or to take a last stand as a materialistic “practical reason” argument. Nevertheless, considering the Marxist insight that labor is the result of the relationship between humans and nature (Patterson, 2003), the landscape of *Lavras do Abade* appears to be a reminiscent of capitalist historical decisions. According to Heckenberger (2005), history is expressed, produced and reproduced in landscapes where a conjunction of culture and nature (or body and land), creates a place of memory.

According to Lansing and others (1998), determined landscapes acquire a value of “natural capital” that accommodate both complex ecological and social historic processes. Similar to the *Skokomish* river study, the *Almas* river only acquired fully natural capital after its degradation. In both cases, the traditional communities measured the losses only by decrease of rivers biological productivity. In both cases, the shared memory of the population shows the natural capital of the river, sometimes recovered only by archaeological works as in *Skokomish* river, or otherwise also with oral history work as in the *Pirenópolis* interviews about the *Almas* river.

The time changes of environmental systems are phenomena mapped out both by the historical ecology and historical archaeology. According to Redman and others (2004), human impacts cannot be blamed on a single factor, such as increasing population or despotic rulers. The individuals, groups, and entire societies, sometimes make decisions that initially are both productive and logical but over time have negative and sometimes disastrous implications over the environment; and the importance of these studies is in the predictability and resilience of these human ecosystems; predictability because the impact of forces that act on the system can be anticipated on the basis of past experiences. On the other hand, the resilience of a system is its ability to resist or accommodate external pressures without seriously transforming itself. In the case of *Lavras do Abade*, the environmental changes are perpetuated not only in the terrain alterations or the pollution legacy, but also in the collective and cultural memory of the informants.

⁹⁴ “In summary, heterarchies are self-organizing systems in which the elements stand counterpoised to one another” (L. C. Crumley, 2006:387).

Environmental Conflicts and Water Management

Generally, environmental degradation in Brazil is related to Amazonian deforestation (Kirby et al., 2006 ; Laurance et al., 2002; Malhi et al., 2008); however this is a vision that rests on an absolutely biased condition that all Brazilian society is totally marginal to an environmental consciousness of natural resource preservation. In this way, researching a conflict about a natural resource such as water in Brazil is both an innovative concept as well as a contemporaneous and current issue in other parts of the globe. For example, the work of Villarroel and Peredo (2006) presents the Andean cultures (peasants and indigenous) as hydraulic communities, which are based in large and historical concepts of water uses and customs. Conversely, Bolivia's state is presented as a large and complex legislator of water, but with a discourse to neoliberal actions that guarantees private investments above natural resources, and which ended in April 2000 with a regional conflict between the population and the state.

In conclusion, Villarroel and Peredo (2006) establish that not only the water rights, but also water distribution systems are influenced by history. In another example, Bustamante and others (2004) expose the conflicts involving water management in Tarata city, where two equal rural groups compete for the water pipeline. Bustamante and others conclusion is that the problems are since the definition of what water supply for 'domestic' use meant to different stakeholders, the sale of water rights, and motives of key actors in the conflict, until the weaknesses in the enabling environment in Bolivia.

These two examples regarded water conflicts and environmental degradations, that in the case of *Lavras do Abade* is historically constituted by the gold mining pollution using mercury in the *Cerrado* biome through its mainly ecosystem: the *Almas* river. The study of river ecosystems as offered by Whol (2004) is a mandatory issue to compound this mosaic of information. The perception that "an ecosystem consists of all the organisms in a community and the associated nonliving environmental factors with which they interact" (Wohl, 2004:06) represents an interpretation that the human actions on the environment in terms of a holistic historical ecology and an archeological point of view are not disconnected from causes and consequential effects.

According to Whol (2004), the prolonged, extensive or severe impacts can lead to a permanent loss of species and consequential decreased biological diversity within the river. In the case of mining activity, the leaching of heavy metals from mine tailings contaminate

water and streambed sediments for miles downstream and destroy animal communities for decades. As an example, Whol comments that in California the hydraulic mining (same type of exploration used at *Lavras do Abade*) was invented around 1853 and operated on a large scale in the northern Sierra Nevada from the 1850s to the 1880s; but a court decision in 1884 banned the discharge of mining sediment into streams and thus shut down hydraulic mining, unless the sediments could be detained behind a dam.

However, the remaining effects of nineteenth-century mining continue to impact streambed elevations and stability along the *Yuba* river during the twenty-first century. Whol (2004) alerts that the only remediation of mining contamination may involve no human action if the natural sedimentation is likely to bury and contain the contaminants, or if the natural degradation and solution process can reduce contaminant loads. Nevertheless, in the case of *Lavras do Abade*, more than at the *Almas* river, all the *Cerrado* biome was and probably still is affected. A broad study about the mining impacts in the *Cerrado* biome needs to be conducted, although unfortunately not at this time.

In conclusion, the *Lavras do Abade* historical *eco*-archaeology research understands that the event that occurred on the site was not only an environmental fight, but also an economic disparity, and a political struggle. In the *Lavras do Abade* conflict, the dialectic was formed on two distinguishable levels, the internal and external. On the internal level, it was formed through the spatial organization of structures and wealth of material culture vestiges in the village, which revealed the economic disparity factors associated with the event. On the external level, it was formed through the historical and cultural expressions of farmers and miners, which revealed the political issue factors associated with the fact. However, the mining pollution study of the water resources revealed that the ecological fight factors cannot be only associated with this incident. Because both societies had polluted the water by more than one quart of a millennium, in this case historical environmental damage was realized by the *Lavras do Abade* goldmine, but also by the old *Meia Ponte* goldmines, in the *Almas* river.

Finlay, the historical *eco*-archaeology study of *Lavras do Abade* is an inherent act of praxis, and in consequence, it is understood as an exercise of critical archaeology (Leone, Potter, & Shackel, 2000; Palus, Leone, & Cochran, 2006; Wilkie & Bartoy, 2000). This ultimately results, according to Matthews and others (2002), in a “scientific instrument” which reveals the implicit game of metonymies and metaphors in rethinking our contemporary relation with nature.

Final Considerations and Future Directions

Archeological excavations not found vestiges of conflict in the site, but a small quantity and high quality of material culture related to everyday life of the miners in the *Lavras do Abade*. The preliminary structural and spatial analysis of the site also indicated the existence of urban patterns probably related to industrial cities. This leads us to conclude that the archaeological vestiges and spatial organization of the structures demonstrated a high level of economic and social segmentation inside of the mine, as well as, between the *Lavras do Abade* and *Meia Ponte* villages. In light of this, the question that emerges is if the samples of archaeological vestiges recovered in the excavations were representative of all population that lived in the *Lavras do Abade* site? To address this question in future studies will be necessary the increase of the archaeological sample with excavation of others units and to expand of those already existed, such as the miner's houses, canteen, smithy, drover's house, and factory.

However, the archaeological investigations were also conducted with plentiful recognition of the information reveled by documental and pictorial sources. The knowledge of the historical facts also contributed to the organization and program of the archaeological research. In complement, the historical insights were also responsible for the verification and counter-verification of the material studies formulations.

On the other hand, the archaeological investigation also used the resident's memory insights to identify and interpret the material culture and structures. The individual's related memories that served as rich spaces of information about the function of determined structures as well as the value contribution about the landscape knowledge. The memories also reveal the political component of the materiality and characterize the socioeconomic relations.

Finally, the *eco*-archaeological investigations also demonstrated that the materiality is not the only source of the information to deep-time oriented investigations. The landscape construction is at same time historically formed and spatially organized. In this way, the synchronic mutualism of the environment and material culture also represents the present perception about the past choice realizations and the dynamic dependence between the organic and inorganic.

The investigation of memory in the city revealed that there are two discourses about the event, one popular and another from elite. It also revealed a religious manifestation in the present day with elements that possibly remember the *Lavras do Abade* conflict. This leads

us to conclude that the memory of the conflict is used today in the environmental discourse by the elite segment of *Pirenópolis* society, while the popular discourse is more about economic disparities and the political struggles that occurred in that time. In light of this, the question that emerges is if the popular and elite discourses are also manifested in the religious event of *Mascarados*; and how? To address this question in future studies will be necessary a further study about the *Mascarados* manifestation in the *Pirenópolis*, its history and connections with other historical events in the city, as well as with others manifestations in other cities and increase of interviews about the memory of conflict with the residents.

However, the memory study was also validated by the historical documents, and the memories collected were illustrated with rich details of the historical archaeological research. The communal discourse of remembrance and forgetting was identified through the study of the historical and material facts. On the other hand, the historical facts were organized and constructed through an external logic of local memories studies.

In addition, the memory study also had found material correlatives to the narratives of the conflict. The collective and cultural memory constituted about the event is physically present in the material aspects recovered by the archaeological and historical practice. The materiality of the facts were also re-dimensioned the event and helped to segment what was historically constructed from the interviewee's present perceptions inside of the social remembrance.

Finally, memory research receives a new dimension of sensibility. The individual and collective statements are guided by the environmental influence, and the increased or decreased discourse was directed according to the wealth, and perception of the nature. In this way, the *Pirenópolis* society adjust its present narrative not only according to the desired past, but also with a future perspective.

The soil sample study revealed two historical pollutions, one in 19th century in the *Lavras do Abade* area, and another in the 18th century in the *Meia Ponte* (today *Pirenópolis*) area, but without any connection between them. What leads us to conclude that the mercury pollution from *Lavras do Abade* mine not actually achieved the *Meia Ponte* village in the period of nineteenth century. Despite the historical documentation about the mud and the dirt water from the mining activity in the *Almas* river. In light of this, the question that emerges is if besides the heavy metal analysis what other kind of analysis could be made to identify historical mining pollution's? To address this question in future studies will be necessary a complementary analysis of the soil samples and/or new collections of other type of samples

that could indicate a soil and water pollution in the area by the historical mining activities, and its intensity, duration and temporality.

On the other hand, the environmental research had absorbed the diachronic dimension of the human modifications in the natural area. The historical documents registered a past landscape that is not more observable because the successive alterations of the surroundings. In complement, the write and image researched registers were also the best ways to examine the temporal changes caused by the men action in the process of natural adaptation.

In addition, the environment and site materiality also had a huge correspondence, besides the fact that the *Almas* river spatial analysis was the vector to the soil collection. The material practices had directly affected the environmental organization in the area. The historical impacts are today represented by the transformations of the landscape, in the space, and the pollution legacy is deep related to the spatial formation of the site.

Finally, the environmental research also acquired the real social value through the perpetuation of the story of the event that the today community had selected and exposed according its interests. The interviewed informants were elements that not only contributed to the environmental research, but also they served as the receptors for the investigation results. In resume, a strict oriented natural study is null without the dialectical integration with the living people around.

In resume, the multidisciplinary approach of *Lavras do Abade* case study demonstrated the possible interdisciplinary analysis of these archaeological vestiges, which have a historical function of memory mechanism to an environmental conflict caused by economic and political tensions.

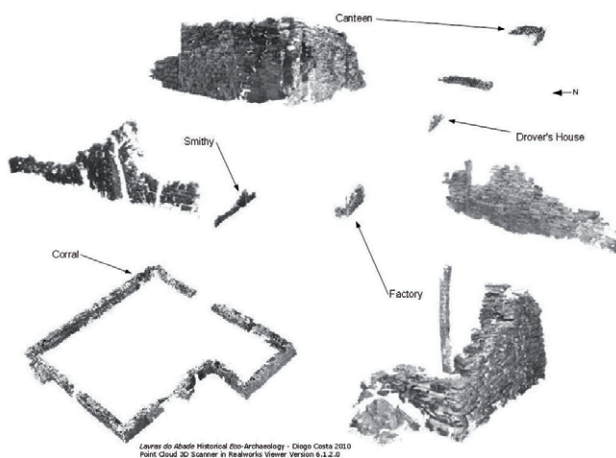


Figure 7-1. *Lavras do Abade* point of cloud – (no scale).

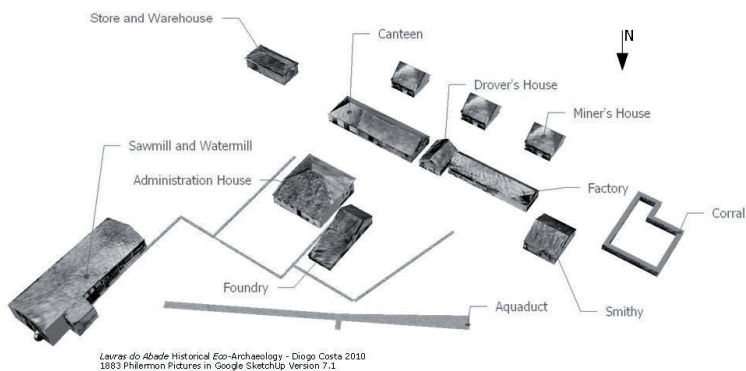


Figure 7-2. *Lavras do Abade* virtual model – (no scale).

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The Lavras do Abade research is a multiple perspective archaeological study about the environmental impacts of a gold mining village in Mid-Western Brazil that was destroyed by neighboring villages at the end of the nineteenth century. According to local narratives, the conflict was the consequence of a dispute about the control and use of natural resources, such as water. However, this investigation reveals that the conflict was caused also by economic and political disputes between the villages in the region. In this work, each stage of investigation is presented in separate chapters. Research was conducted to validate hypotheses and to combine different approaches to each element that compounds this mosaic of information. The result of this work is a combination of various complementary investigations into the same object, and is a theoretical and methodological referential that establishes the Lavras do Abade case study as an original bridge to understanding many "Water Wars" in the modern world today.



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Diogo M. Costa was born in Brazil, he have bachelor's degree in history, master's degree in cultural resource management, and PhD in anthropology. He participated in more than twenty eight different archaeological projects in the last fifteen years, and his main focus being on historical archeology.



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