

THE LIFE AND DEATH OF MEDIEVAL ETHIOPIAN PRIESTS: A  
BIOARCHAEOLOGICAL AND OSTEOLOGICAL INVESTIGATION OF HUMAN  
MUMMIES FROM ABUNE MELKETSADIK AND YIMREHANE CAVE MONASTERIES,  
ETHIOPIA

By

ABIYOT DEBEBE SEIFU

A DISSERTATION PRESENTED TO THE GRADUATE SCHOOL  
OF THE UNIVERSITY OF FLORIDA IN PARTIAL FULFILLMENT  
OF THE REQUIREMENTS FOR THE DEGREE OF  
DOCTOR OF PHILOSOPHY

UNIVERSITY OF FLORIDA

2016

© 2016 Abiyot Debebe Seifu

To all Ethiopian Christians martyrs Killed by ISIS in Libya,  
to my father, to my sisters, and to Hanna Amare

## ACKNOWLEDGMENTS

I thank my committee chair, Dr. Steven Brandt, first and foremost for his extraordinary support, advice, and patience these past few years. He was always there, every step of the way and also helped me to develop critical thinking. This dissertation would not be possible without his support and guidance. I would also like to thank my doctoral committee for their advice on the area of their specialization throughout the entire PhD process. I am grateful to the National Geographic Society, Waitt Grants Program, for providing funding for the field work and I would particularly like to thank the Waitt Program Coordinator, Fabio Esteban Amador.

I am grateful for the generous assistance of the Department of Anthropology for providing financial assistance for my fieldwork. In particular, I am indebted to Dr. Susan deFrance for her unwavering support. I am also grateful for the countless support of Juanita Bagnall, Karen Jones and Pamela Freeman. I am also grateful to the African Studies for the fellowship and funding my dissertation providing. In particular, I am grateful for Dr. Leonardo Villalon, Dr. Abe Goldman, Dr. Agnes Leslie, Dr. Mary Watt, and Dr. Todd Leedy, who facilitated my graduate study and fieldwork funding.

I would like to thank Dr. John Krigbaum for generously extending his assistance to cover the isotope samples cost and interprets the results. I would also like to thank Dr. Michael Warren for allowing me to use the C.A Pound Lab for the forensic analysis. I want to extend my sincere appreciation to Robert Galluccio and Michala Schaye, who spent several hours in the lab to prepare and analyze the result.

I would also like to express my gratitude to Dr. Yonas Beyene, Dr. Kassaye Begashaw, Dr. Alemseged Beldados, Dr. FeKadu Gashaw and Dr. Hana Getachew, who provided material and precious advice during the data collection period. I also

acknowledge the support of Dr. Abiyot Legesse, Dean of the Graduate School and the faculty and staff at Dilla University, who warmly received me, gave me space to work, and accommodation. I thank the Authority for Research and Conservation of Cultural Heritage for their continuous support of my doctoral research. In particular, I thank Ato Yonas Desta, Director of ARCCH, who worked hard to facilitate my fieldwork by contacting state and local officials. I am also grateful for the Amhara Region, the Northern Shewa and Wello, Culture and Tourism Bureau, who facilitated the research permit. I would also like to extend my gratitude to the Lasta Woreda Culture and Tourism Bureau Head Adera Chane, who worked tirelessly to facilitate the work permit and the research project. I am also grateful for the role of Mengistu Gobeze, for his expertise and support. I am incredibly grateful for the work of Yibzawork Mesfin and Debreguad Sellassie Renovation Committee, who facilitated the excavation and data collection process.

Numerous people contributed to this dissertation in different ways, and I want to thank you all for being my guardian angels. I would like to extend my appreciation especially to Dr. Dawit Woldu, Dr. Asmeret Mehari, Lucas M. Johnson, Sara Stefanos, Jesse A. McClelland and Justin Dunnavant, who edited my dissertation. I am especially grateful to Paul Murray, who made me a better writer. He devoted a substantial amount of his time to polish my dissertation and kept my spirits up. It was my privilege working with him as he is very punctual, responsible and above all, very tirelessly supportive. I am also grateful for the help of Linda, who also edited my dissertation.

I would also like to extend my gratitude to Brigitte, Danny, Albert, Andrea and Tigist for continuous encouragement. I would like to extend my appreciation particularly

to Tigist Tolera (mimi), who provided material and look after my family when I was away for fieldwork and Andrea for editing my dissertation.

I have also been fortunate to have wonderful friends for more than three decades who are the member of the Senate, namely Abebe Mebrate, Solomon Legesse, and Joni Girma. They are my inspirations and encouraged me every step of the way. I am also indebted to Dr. Tesfamariam, Sewalem and Shimelis, who provided me accommodations and a long time true friends. I also want to thank Halleluiah, Nahom, Caleb and Eferata for their untold encouragement.

I have been fortunate enough to have wonderful extended family members who contributed tremendously in different ways. My heartfelt thanks go to my mother Kebebish Geda, who helped me every step of the way. I am also grateful for my brothers Asfaw, Teferi, Asrat, Yirgedu Serkalem and Tigist Debebe. I am also grateful for the help of Aynalem Yifru, Eyob Haile, Thomas Assefa, George Melaku Getnet and Fikirte, Adey and Hanny Abebe. I am very grateful for especially for Eyob and Thomas, who spend their precious time to format my dissertation.

Finally, I would like to extend my most gracious appreciation to my beloved wife Minaye Desie Tefera, and my two beautiful daughters Mighty and Naomi Abiyot, who were stood and encouraged me. Minaye's courage and wisdom inspired me to work hard and endure the challenges. She dedicated her time to take good care of our daughters, and it helped me to finish this dissertation. I am the luckiest person in the whole world to have them. This dissertation would not have been possible without their support.

## TABLE OF CONTENTS

	<u>page</u>
ACKNOWLEDGMENTS.....	4
LIST OF TABLES.....	10
LIST OF FIGURES.....	11
LIST OF ABBREVIATIONS.....	15
ABSTRACT.....	17
CHAPTER	
1. INTRODUCTION.....	20
Research Goals and Objectives.....	25
Research Methods.....	26
On-Site Data Collection and Analyses.....	26
Off-Site Methods of Analysis.....	27
Challenges and Limitations of the Study.....	27
Structure of the Dissertation.....	31
2. HISTORY OF MUMMIFICATION IN EGYPT AND NUBIA.....	36
Etymology of Mummy and Mummification.....	36
Previous Works on Mummies and Mummification in the Egypt and Nubia.....	38
The Origin of Mummification in Egypt.....	41
Neolithic to Early Dynastic Mummification (c.5000-2686 BC).....	41
Old Kingdom Mummification (c.2686-2160 BC).....	42
First Intermediate Mummification (c.2160-2055 BC).....	44
Middle Kingdom Mummification (c.2055-1650 BC).....	44
Second Intermediate Period Mummification (c.1650-1550 BC).....	45
New Kingdom Mummification (c.1550-1069 BC).....	45
Third Intermediate Period Mummification (c.1069-664 BC).....	46
Late Period (c.664-332 BC).....	47
Ptolemaic Period (c.332-30 BC).....	47
The Roman Period Mummification (c.30-395 AD).....	48
Coptic Period Mummification (c.395-641 AD).....	48
Mummification in Nubia.....	49
Materials Used in Mummification.....	50
Aromatic Substances.....	50
Adhesive Substance.....	51
Deterrent Substances.....	52
Classification of Mummies.....	53

Processes of Mummification .....	57
Motives for Mummification .....	61
Summary .....	62
<b>3. HYPOTHESIS OF MUMMIFICATION PRACTICES IN ETHIOPIA AND ERITREA .....</b>	<b>64</b>
Sources of mummification.....	64
Traditional sources .....	65
Historical sources .....	69
Archaeological Source .....	71
Christianity in Ethiopia and Eritrea.....	71
The Nine Saints and Expansion of Mummification .....	72
The Development of Cave Monasteries and Monasticism in Ethiopia and Eritrea .....	73
Mummification Tradition in Eritrea .....	73
Mummification Practices in Ethiopia .....	74
Mummies in North and Central Ethiopia.....	75
Mummification in Southern Ethiopia: The Konso People.....	76
Summary .....	77
<b>4. ARCHAEOLOGICAL RESEARCH ON CAVE CHURCHES AND MUMMIES IN NORTHERN AND CENTRAL ETHIOPIA.....</b>	<b>88</b>
Bioarchaeological and Geoarchaeological Studies.....	88
Physiography of Northern Wello and Shewa Zones .....	92
Previous research on the Development of Cave Churches in Ethiopia.....	93
Archaeological Survey and Study Sites Mapping .....	99
Tseha Michael Cave Monastery.....	99
Kara Meshige Fort.....	100
The YK Cave Monastery .....	100
The AM Cave Monastery.....	102
DS Cave Monastery .....	103
Summary .....	104
<b>5. ARCHAEOLOGICAL SURVEY AND EXCAVATION OF SELECTED SITES .....</b>	<b>121</b>
Reconnaissance Survey .....	121
Field Data Collection.....	124
Field Assistants and Workers .....	124
Archaeological Field Survey .....	125
Excavation: Golden Opportunity and Challenge.....	128
Archaeological Excavations of the DS .....	131
Excavation Locality I.....	132
Excavation Locality II.....	135
Excavation Locality III.....	137
Summary .....	139

6. BIOARCHAEOLOGICAL AND OSTEOLOGICAL DATA OF MUMMIES FROM THE DS, AM AND YK STUDY SITES.....	153
Mummy Inventory .....	153
Metrics Measurements and Analyses.....	154
Nonmetric Variation Analysis.....	155
Data Analysis Software Tools .....	155
Fordisc 3.....	155
Statistical Package for the Social Sciences.....	155
ArcView GIS .....	156
Physical Anthropology Analysis .....	156
Social Status Determination .....	157
Sex Determination.....	158
Age Estimation .....	159
Paleopathology.....	161
Cranial Analysis using Fordisc 3.1 .....	162
Summary .....	164
7. ANALYSIS OF ARCHAEOLOGICAL FINDS AND MUMMIES FROM THE DS, AM AND YK SITES.....	174
Archaeological Findings.....	174
Altar Tables, Ge'ez Scripts and Monographs .....	174
Crosses Associated with Mummies.....	175
Burial Coffins and Wrapping Materials .....	184
Mummifications in the DS, AM and YK Study Sites.....	184
Dating and Isotope Analysis .....	185
Radiocarbon Dating of Teeth.....	185
Isotope Analysis of Hair and Bone Samples.....	186
8. DISCUSSION, CONCLUSION AND RECOMMENDATION .....	212
Discussions.....	212
Conclusion .....	223
Recommendations.....	226
Future Studies .....	227
LIST OF REFERENCES .....	233
BIOGRAPHICAL SKETCH.....	244

## LIST OF TABLES

<u>Table</u>	<u>page</u>
3-1 The names of the saints, place of origin and the monasteries they founded in different part of the Aksumite Kingdom. Source Ethiopian Orthodox Church. ....	79
3-2 Distribution of mummies in Bugna and Last Woreda of Northern Wello and Mida Woremo of Northern Shewa. Source: Mida Woremo and Lasta Woreda Cultural and Tourism Bureau.....	79
5-1 Code used to collect data from all monasteries.....	141
5-2 Multiple interments of mummies excavated from Burial Grave VII. ....	141
5-3 Distributions of documented mummies form the YK, AM and DS sites. ....	141
6-1 Distribution of mummies in the study sites. ....	166
6-2 Total distribution of status in the AM, DS and YK sites.....	166
6-3 The characters of the male and female skulls used for sex determination. ....	166
6-4 Comparative distribution of status in the AM, DS and YK sites. ....	166
6-5 The developmental stage of age classification .....	167
6-6 Sex distribution in the study sites. ....	167
6-7 Sex distribution of mummies in each study sites. ....	167
6-8 The distribution of age in the study sites. ....	167
6-9 Fordisc 3.1 Results Using Howells’s Cranial Data.....	168
7-1 Crosses discovered from the AM cave monastery. ....	190
7-2 State of wrapping condition. ....	190
7-3 Types of mummification in the study sites. ....	190

## LIST OF FIGURES

<u>Figure</u>	<u>page</u>
1-1	The AM and DS study sites in central Ethiopia: the small red square shows the relative location of the Meragna town and the surrounding area in Mida Woremo district in Northern Shewa ..... 34
1-2	The YK study site in northern Ethiopia. Northern Wello is colored in red while the bottom map shows the physical map of the DS, located at the base of Abune Yosef Mountain. .... 35
3-1	The Debre Damo monastery, the height is 25 meters and only men access it. The monastery also host several mummified human remains..... 80
3-2	Mummies discovered from the Dabre Libanos monastery in Ham, Eritrea. The mummies belonged to diverse social status. .... 81
3-3	The Beter Giyorigis rock-hewn church, World Heritage site, and shows representative catacombs and hosted the last mummified human remains. The cranial and upper postcranial parts of mummies were significantly damaged. .... 82
3-4	Catacomb in Lalibela rock-hewn Church..... 83
3-5	Tourists visiting the site of YK during fieldwork..... 84
3-6	Kala Kayote’s mummified body presented to mourners just before his burial (eight years after his death) in the Kala forest ..... 85
3-7	Wooden anthropomorphic statue erected in 2002 for the Waka of Kala Wolde-Dawit who was the ritual chief or Poquola of Gamole, Gocha and Mechelo paletas. .... 86
3-8	Anthropomorphic statues depicting the living ritual chief priest called the Bamale and his wife. The zoomorphic wooden statue of la eopard in front of them is meant to show Bamale’s bravery. .... 87
4-1	Map of the study sites: The relative location of Mida Woremo and Lasta Woreda in Amhara Region in Ethiopia in Ethiopia. .... 106

4-2	Elevation of the Mida Woremo in central Ethiopia. Both the AM and DS caves are located near Meragna town located at an altitude of 2400 MSL and the sites are found at a lower elevation at 1800 masl.....	107
4-3	Photo taken in the 2013 field season showing the cave of Tseha Michael monastery.....	108
4-4	Kara Meshige Fort.....	109
4-5	The YK indigenous forest and degraded landscape.....	110
4-6	The unimpressive exterior wall of YK. ....	110
4-7	The YK cave church and partial view of the palace.....	111
4-8	The condition and extent mummies particularly, how they are commingled and disarticulated. All the mummies were stacked at the back of YK cave church.....	112
4-9	The tomb of King YK dated back to eleventh century based on new carbon dating. The tomb is found very close to the church signifying the status of the individual. ....	113
4-10	Site map plan of YK. The position of the mummies and skulls reflect the current position after the field work.....	114
4-11	The newly reconstructed cave church and series of retention walls to expand the AM cave monastery.....	115
4-12	Mummified humans composed of different social status: Priests', Monks, Deacons, Nuns and Followers found in AM cave monastery. ....	116
4-13	AM site map.....	117
4-14	DS cave monastery .....	118
4-15	Child mummies from the DS church were found in a secondary deposit.....	119
4-16	DS site map shows the location of the excavation localities and the mummies. The entire area surrounding the church was excavated.....	120
5-1	A semi-subterranean tunnel leads to the Tseha Michael cave monastery.....	142
5-2	DS site selection and clearance for excavation: .....	143
5-3	Crosses excavated during cave church expansion.....	144
5-4	Debre Guad Selassie retention wall. ....	145

5-5	Excavation Unit One in Debre Guad Selassie Cave, field assistant Yohanis Sharew excavating Locality I. ....	146
5-6	Child mummy in Burial Grave I. ....	147
5-7	DSFF 2 in Burial Grave II in the DS. ....	148
5-8	Burial Grave III in the DSFM3. ....	149
5-9	Burial Grave IV and V DSFM4 and DSFM5 in the DS. ....	150
5-10	Burial Grave VI of DSFM6 in the DS. ....	151
5-11	The multiple interment burial grave in the DS: Initially DSFM9 and DSFF10 were exhumed and DSFM11 was moved toward the scale to GSFM12 but GSFM13 was deep inside. ....	152
6-1	Distributions of documented mummies form the YK, AM and DS sites. ....	169
6-2	Status distribution of mummies in the study sites. ....	169
6-3	Status distribution of mummies in each study sites. ....	170
6-4	Sex distribution in all sites. ....	171
6-5	Sex distribution of mummies in each study sites. ....	171
6-6	Age class distribution of mummies from the study sites. ....	172
6-7	Fordisc 3.1 results ....	173
7-1	AMP2. ....	191
7-2	Anthropomorphic shaped cross (AMC1) on AMP2. ....	192
7-3	AMP3. ....	193
7-4	Anthropomorphic shaped cross (AMC2) on AMP3. ....	194
7-5	AMP4. ....	195
7-6	Anthropomorphic shaped cross (AMC3) on AMP4. ....	196
7-7	AMP5. ....	197
7-8	Rectangular shaped cross (AMC4) on AMP5. ....	198
7-9	AMD1. ....	199

7-10	Rectangular shaped cross (AMC5) on AMD1.....	200
7-11	AMD1. ....	201
7-12	Rectangular shaped cross (AMC6) on AMP3.....	202
7-13	AMM1.....	203
7-14	Anthropomorphic shaped cross.....	204
7-15	AMN2. ....	205
7-16	A rectangular shaped stone cross. ....	206
7-17	AMN3. ....	207
7-18	AMC9 is anthropomorphic shaped leather cross that was discovered on AMN2. It is found on the right side hand fingers. ....	208
7-19	Burial coffin.....	209
7-20	State of wrapping condition across the study site.....	210
7-21	Calibrated Carbon 14 results.....	211
8-1	Multiple stabbing on the hand, ribs and skull of AMFM10. ....	228
8-2	The leg of AMFF5 severely damaged by Leprosy. ....	229
8-3	Mummified and well-preserved goiter on AMFF 24. ....	230
8-4	YK 57 biparietal resorption or bilateral concentric parietal thinning. ....	231
8-5	Taphonomic impact insect feeding on the mummies. ....	232

## LIST OF ABBREVIATIONS

AD	Anno Domini
aDNA	Ancient Deoxyribonucleic Acid
AM	Abune Melketsadik
AMC	Abune Melketsadik Cross
AMD	Abune Melketsadik Deacon
AMF	Abune Melketsadik Follower
AMFF	Abune Melketsadik Follower Female
AMFI	Abune Melketsadik Follower Infant
AMFM	Abune Melketsadik Follower Male
AMM	Abune Melketsadik Monk
AMN	Abune Melketsadik Nun
AMP	Abune Melketsadik Priest
ARCCH	Authority for Research and Conservation of Cultural Heritage.
BC	Before Christ
CM	Centimeter
DS	Debreguad Sellassie
DSD	Debreguad Sellassie Deacon
DSF	Debreguad Sellassie Follower
DSFF	Debreguad Sellassie Follower Female
DSFI	Debreguad Sellassie Follower Infant
DSFM	Debreguad Sellassie Follower male
DSM	Debreguad Sellassie Monk
DSN	Debreguad Sellassie Nun
DSP	Debreguad Sellassie Priest

EOC	Ethiopian Orthodox Church (EOC)
UNESCO	United Nations Educational, Scientific and Cultural Organization
YK	Yimrehane Kristos
YKD	Yimrehane Kristos Deacon
YKF	Yimrehane Kristos Follower
YKFF	Yimrehane Kristos Follower Female
YKFI	Yimrehane Kristos Follower Infant
YKFM	Yimrehane Kristos Follower male
YKM	Yimrehane Kristos Monk
YKN	Yimrehane Kristos Nun
YKP	Yimrehane Kristos Priest

Abstract of Dissertation Presented to the Graduate School  
of the University of Florida in Partial Fulfillment of the  
Requirements for the Degree of Doctor of Philosophy

THE LIFE AND DEATH OF MEDIEVAL ETHIOPIAN PRIESTS: A  
BIOARCHAEOLOGICAL AND OSTEOLOGICAL INVESTIGATION OF HUMAN  
MUMMIES FROM ABUNE MELKETSADIK AND YIMREHANE CAVE MONASTERIES,  
ETHIOPIA

By

Abiyot Debebe Seifu

August 2016

Chair: Steven Andrew Brandt

Major: Anthropology

This dissertation uses a bioarchaeological and osteological approach to study the life and death of medieval Ethiopian priests. It investigates the practice of mummification by analyzing hundreds of extremely well preserved mummies recovered from monasteries in central and northern Ethiopia. However, who specifically were these mummified clergy members? What roles did they play in Ethiopian society before they died? Were all priests mummified, and if not, why were only some selected? Who and why were the adults and children interred with the clergy? What specific methods were used in the mummification process and who performed them? During the summer of 2013, 2014 and 2015, extensive reconnaissance surveys and archaeological excavations were conducted. Various specialized bio/osteo/forensic programs such as Fordisc Discriminant, Carbon 14 dating of teeth and isotopic analysis of hair samples were performed.

A total of 221 mummified human remains were examined, with ecclesiastical group mummies representing 63% (141), and the remainder being followers. Male

mummies represented 71% (157) and female represented 29% (64) of the total indicating that medieval Ethiopian societies were patriarchal. Monasteries were exclusively reserved for the clergy and elite groups while open burial graves were used for the commoners. The remaining women and other non-elite groups were buried in the open burial cemetery near their local churches.

The Fordisc program classifies the crania into Dogon Mali, Egypt Gizeh, 600-200 BC, Teita - S.E. Kenya, Bantu-speaking, Zulu South Africa, Black, and White. The program barely shows any phenotypic or genetic distinctiveness of the skulls. Hence, the application of Fordisc to the Ethiopian population is limited mainly due to the absence of representative sample on the forensic data bank. Nevertheless, the skeletal data is useful if included in the forensic data bank to represent sample population from northern Ethiopia. The isotope samples provided a clue about the overall diet of mummies in north and central Ethiopia, which was predominantly C3 plants, mixed with C4. The results do not reveal diet variations among the mummies. Carbon 14 dating result was inconclusive due to the Suess effect.

The palaeopathological analyses provide data about the presence of leprosy, rickets and goiter were recorded in the study sites. Another rare age-related pathology called parietal thinning, which is attributed to non-progressive congenital dysplasia of the diploe, postmenopausal and senile osteoporosis progressive disease, and not an anatomic variant (Luk et al. 2010) were documented. Similar bilateral parietal thinning was recorded on YK57 skull only.

Mummification is a pre-Christian practice, but it has been incorporated into the Christian tradition. Coptic Egyptians might have introduced it to Ethiopia. Monasteries

were centers for such mummification practices aimed at purifying the body and soul. Mental mummification/spiritual mummification represented more than 75% of the mummies found in the study sites. It includes priests, monks and nuns. In Orthodox Christianity, an emphasis is given to the soul rather than the body, as the latter is the vehicle to reach the next world. Local people use the relics for spiritual/physical healings. Strangely, mummification is neither officially permitted nor prohibited.

## CHAPTER 1 INTRODUCTION

This dissertation uses a bioarchaeological and osteological approach to study the life and death of medieval Ethiopian priests. It is based on the study of mummified human remains found in the Amhara Region of Ethiopia dating from the 12<sup>th</sup> to the 20<sup>th</sup> centuries. Thousands of remarkably well-preserved mummified bodies of priests and other unidentified individuals were found in the Debreguad Sellassie (DS), Abune Melketsadik (AM) cave monasteries in central Ethiopia (Figure 1-1) and the Yimrehane Kristos (YK) cave monastery in the north and central Ethiopia (Figure 1-2). However, who these mummified individuals were, why they were selected for mummification, what roles they played in Ethiopian society, and what specific methods were used in the mummification process were virtually unknown. This was due to: 1) the absence of scientific studies of previously-discovered mummies; 2) very limited archaeological excavations of medieval sites; 3) an overdependence by historians upon the heavily biased writings of the “Royal Chronicles”; and 4) lack of detailed research on the oral traditions of clergy and the farming communities over which priests presided over.

Previously unknown to scientists, the YK, DS and AM mummies were interred sometime between the 12<sup>th</sup> and 20<sup>th</sup> centuries according to local oral tradition and limited monastery documents. Therefore, they offer an unprecedented opportunity to conduct systematic inventories and detailed bioarchaeological, aDNA, osteological and forensic analyses of Ethiopian mummies. This dissertation is expected to contribute to 1) a greater understanding of the ecological, economic and socio-political relationships that medieval priests and other clergy developed with church/secular rulers and

commoners; 2) the first Ethiopian mummy database; and 3) government efforts to register the YK as a World Heritage Site on the UNESCO World Heritage List.

The Ethiopian Orthodox Church (EOC) has been an active player in the spiritual, social and political life of Ethiopians since the 4<sup>th</sup> century AD when the Aksumite King Ezana introduced Christianity to the highland populations of northern Ethiopia (Finneran 2005, 2009a, 2013; Phillipson 2009; Sergew 1972; Tadesse 1972). During the Aksumite civilization, Christianity expanded within and outside of the kingdom. For example, the Aksumite king, Kaleb, invaded South Arabia to protect the Christian minority and expand the Aksumite kingdom's sphere of influence. However, the rise and rapid spread of Islam in the Horn of Africa after 702 AD combined with internal social/political challenges and the loss of Red Sea trade routes, contributed to the decline of Aksum. The supposed sacking of Aksum around 980 AD by the Beta Israel Queen Judith (Yodit Guddit) marks the beginning of Ethiopia's "Middle Ages" (Sergew 1972).

With the rise of the Zagwe Dynasty by 1137 AD, Christianity once again became the dominant religion of the Highlands (Finneran 2009, 2012; Selassie 1972; Tadesse 1972). Most of the Zagwe rulers were priest-kings (e.g., Yemirehane, Lalibela, Harbe, Ne'akto Le'ab) who used the Church as a way to legitimize their power and wealth (Crummey, 2000). They built magnificent churches to replicate those in Jerusalem and established theocratic institutions that maintained an iron grip over feudal Medieval Ethiopian society for hundreds of years (Finneran 2009b, 2013). One of the earliest priest-kings was the YK, who in the 12<sup>th</sup> century built a church/monastery in a cave near the ancient Zagwe capital of Lalibela (Anfray 1985; Finneran 2013). Drawing upon

ancient Ethiopian designs, the monastery is a classic example of the architecture that was to epitomize medieval Ethiopia (Mengistu 2004; Munro-Hay 2002; Phillipson 2012, 2009, 2004). Upon his death, Yimrehane Kristos' body was entombed in the prepared burial tomb. The burial chamber is found at the back of the church and completely covered with colorful clothes (Mengistu 2004) and regarded by the local followers as a sacred tomb. The monastery guards, priests, and all the local communities closely monitor the tomb to deter any unintended intrusion.

With the demise of the Zagwe rulers and the rise of the Solomonic Dynasty of secular rulers in 1270 AD (Phillipson 2009; Tadesse 1972), the EOC was able to maintain its power and prestige by establishing close political ties with the secular kingdoms and through their priests' close social and economic relationships with the feudal peasant communities that represented the vast majority of Ethiopia's highland population. The arrival of the Portuguese in the 1540s brought Ethiopia into contact with the "modern world" and marked the end of the Middle Ages (Crummey 2000; Pankhurst 2002; Phillipson 2009, 2012). Nevertheless, the EOC was able to maintain and even expand its political power, socio-economic influence and wealth to the present time, where it still owns or controls more than 75% of Ethiopia's land (Crummey 2006; Pankhurst 2002; Phillipson 2009).

Priests, just as they did in medieval times, still form the backbone of Ethiopian highland society: they pray for peace, unity and even rain during periods of drought, as well as resolve disputes and preside over important social events from baptisms and weddings to funerals and memorial services (Finneran, 2007, 2009b; Phillipson 2004, 2009). In spite of the significant roles that medieval priests must have played in the

establishment of modern Ethiopian society, knowledge of their everyday activities and relationships with the EOC, secular rulers and commoners and how this relationship with Ethiopian society evolved over the centuries is very limited. Most of what we know about medieval Ethiopian history and culture comes from the Royal Chronicles documents written to serve the interests of the Solomonic ruling classes. Not surprisingly, these materials are limited in scope and often heavily biased (Crummey 2006; Finneran 2009b, 2013). Furthermore, archaeological data are restricted primarily to the limited excavations that have been undertaken in and around the Solomonic royal palaces of Gondar and surrounding regions (Finneran 2014). Therefore, information on Ethiopia's commoners and lower-ranking clergy, including priests, is based almost entirely upon oral traditions, very few of which have been studied by scholars (Finneran, 2009b, 2012; Phillipson 2004, 2009).

While conducting a survey of archaeological sites in northern Ethiopia in the summer of 2012, I became aware of thousands of mummified bodies in the YK monastery and a few mummified bodies in Lalibela as well. Although YK's tomb and the rock-hewn churches were well known to scholars, tourists, and pilgrims, mummies remained unidentified (Chapter 7). According to local oral tradition, mummies in the YK were placed inside the cave at various times between the 12<sup>th</sup> and 13<sup>th</sup> centuries. Intentional intervention by local visitors affected the state of preservation and resulted in the dislocation and destruction of the mummified remains in the cave (Mengistu 2004).

The mummies in the AM and DS monasteries in the central Ethiopian highlands were extremely well preserved. Anfray (1985) mentioned the presence of mummies in the area but was unable to verify the number and their state of preservation. According

to the priests in the AM, most of mummies were unearthed during the expansion of the cave church. Additional artifacts such as crosses, textbooks and altars were discovered. These materials were purposefully buried to save them from the raids of the 16th century Muslim warlord Ahmed Gagn (1520-1543 AD) (Ababu Tekester Berehan). Labels with inscriptions in Ge'ez script attached to the wrapped mummies indicate they were entombed between the 14th and 16th centuries.

The mummies from the YK, AM and DS caves provide an unprecedented opportunity for bioarchaeologists and other scientists to obtain a broad range of data that can help us answer a wide variety of questions pertaining to the life and times of priests and other aspects of medieval Ethiopian life. Who specifically were these mummified clergy members? What roles did they play in Ethiopian society before they died? Were all priests mummified, and if not, why were only some selected? Who and why were the adults and children interred with the clergy? What specific methods were used in the mummification process and who performed them? The following objectives are designed to answer these questions.

Scientific research on prehistoric and historic mummies from around the world has shown that they can provide a wide range of data including but not limited to: sex, stature, pathology, diseases, trauma, kinship, age, diet, the environment, mortuary practices and other activities (Aufderheide 2003; Aufderheide et al.1999; Chamberlain 2003; Cockburn et al. 2003; Ikram 2013; Zimmerman 2009). These researches have also revealed that effective extraction of such vital data requires a multidisciplinary approach by scientists with expertise in CT (Brier et al. 2015; Laitman and Cox 2015; Villa et al. 2015), X-ray (Gostner et al. 2013), DNA (Kulvinder 2015), Isotopes (Basha et

al. 2016), radiometric, GIS, GPR and other specialized analyses in addition to traditional archaeological, osteological and forensic methods (Ousley and Jantz 2012).

While recognizing the need for a multidisciplinary approach, I am also aware of the multiple seasons such research will entail as well as the cost of doing many of the aforementioned specialized analyses. Therefore, my research had to be realistic and limited in the specific research objectives and methodologies employed.

### **Research Goals and Objectives**

The main goal of this study was to obtain bioarchaeological, forensic and osteological data from mummies of the DS, AM and YK to better understand the ways of life of medieval Ethiopians and, in particular, the social, economic and political roles that priests played in medieval Ethiopian society.

This dissertation focuses on the mummies aiming to:

- conduct rescue excavation in the DS to understand burial traditions of Orthodox Christians.
- determine status, age, sex and cause of death from mummies in the YK, AM and DS caves.
- explain types and processes of mummification.
- identify evidence regarding the biogeography of mummies in the YK.
- point out issues related to mummy conservation and preservation.
- understand the role of diet in determining social status in ancient and medieval Ethiopia.
- conduct inter and intra-site comparisons with mummification practices in Egypt, Sudan and Eritrea.

I planned to carry out stature and age estimation from mummies in the study site using advanced technological equipment but the lack of CT-Scan and X-ray machines

deter such examination. As a result stature estimation from the mummies were excluded.

## **Research Methods**

Drawing upon fieldwork and laboratory techniques, this study provides crucial information beyond the individual mummy by offering cultural, biological and environmental data. My study further builds on the existing literature by creating a first-of-its-kind database for future studies of Ethiopian historic mummies (Chapters 5 and 6)

### **On-Site Data Collection and Analyses**

To accomplish these goals, I conducted the following analyses of mummies at the monastery caves of the YK, AM and DS. A site map was prepared for each cave monastery. An inventory of mummies for each cave was conducted, and extensive digital photos and video images were taken. Contextual archaeological data were also collected through a reconnaissance survey and archaeological excavation.

Osteological, forensic and bioarchaeological analyses were carried out using methods that were as non-invasive as possible. Standard morphological criteria and methods established by Bass (1995), and Buikstra and Ubelaker (1994) were used to obtain information on age, sex, stature, pathology, trauma and other variables in order to evaluate evidence for health, trauma, disease and status that could then be used to conduct inter-sites and intra-site comparisons among the sites. Field recorded data were entered into a Microsoft Excel spreadsheet and AutoCAD.

Closer reexamination of photos and videos were crosschecked to include missing information. Moreover, hair, teeth and artifact samples from a representative population were extracted for isotopic and dating analyses.

## **Off-Site Methods of Analysis**

Preliminary analyses of the data were done at the Ethiopian National Museum, Addis Ababa. Carbon 14 dating and isotopic analysis of hair samples were conducted at the University of Florida and University of Ottawa. Various statistical packages were used to analyze the mummy data, including SPSS and more specialized bio/osteo/forensic programs such as Fordisc Discriminant.

## **Challenges and Limitations of the Study**

The significant challenges I encountered include archaeological fieldwork permits, study site accessibility, and permission to collect sufficient samples. Moreover, the lab analysis of radiocarbon dating presented yet another challenge, mainly due to the Suess effect (change in the atmospheric concentration) and the wide range of Carbon 14 radiometric dating for modern materials. Attempts were made to overcome most of the challenges encountered during the process of data collection. Nevertheless, some of the following problems were critical and worth mentioning.

First, the process of getting a permit is cumbersome and subject to delay. According to the Ethiopian Ministry of Tourism and Culture, the Authority for Research and Conservation of Cultural Heritage (ARCCH) grants permits to researcher/s in the area of archaeology and paleoanthropology. The ARCCH guidelines state that the whole process to get a permit takes from one to two months, and researchers are advised to submit their application well in advance of their arrival. However, a lack of funding and scheduling conflicts may prevent researchers from applying in advance. Also, ARCCH requires that researcher completes an application form and remit a \$20 US application fee to the National Bank of Ethiopia, the only bank the government approved to conduct such a transaction. Applications are then submitted to the Director

of ARCCH, who, in turn, sends it to an expert for review. The expert confirms research feasibility, source of funding, payment of fees, and academic credentials, and upon verification offers recommendations to the director, who then has the authority to grant the permit.

While a permit from ARCCH should be the final step in the process, it is only the beginning. Unfortunately, the same process repeats itself at the regional, zonal and *wereda* levels. The bureaucracy gets even worse when a representative of cultural office at the lower level is not available. In the case of this study, the permit was delayed for a longer period than anticipated, which inevitably resulted in a huge waste of money and time.

Another challenge that proved even more frustrating than obtaining government permits was getting the EOC permit. To elaborate permits from both the government and EOC may not necessarily apply to lower religious institutions, who often claim full autonomy regarding the local church matters. In fact, permits are often disregarded by lower ecclesiastical authorities, who may impose new requirements, refuse samples, reduce permit days, or deny access to the site.

Fortunately, during the 2013 field season, I received permits from both the government and EOC. The ecclesiastical authorities at the AM cave monastery, however, rescinded the permit and granted only a three-day permit for the research. Therefore, I selected the DS, from previously surveyed sites. However, an antiquity officer of the Mida Woremo Cultural and Tourism Office banned access to the DS. After attempting to gain access to the site for seven days, reported the matter to the ARCCH Director, who responded quickly by sending a letter of protest to the Mida Woremo

Woreda Cultural and Tourism Office. Subsequently, a permit was granted to the DS cave monastery. The need for this letter was a testimony to the unnecessary duplication of bureaucracy.

Despite many similar challenges, during the 2014 field season, I received a permit from both the government and EOC. However, the EOC hierarchy permit was not issued by the Lasta woreda EOC representative, and a meeting of ecclesiastical authorities was called to discuss the issue. Two weeks later, I was informed that the official responsible for the permit would not return in time to approve the fieldwork in question. Expecting the worst outcome, while waiting for a decision, I conducted an archaeological survey near Lalibela where numerous monasteries were found (Chapter seven 7).

Second, even though thousands of mummified human remains are stacked in different cave monasteries throughout the country, I had limited access to mummies. Since most monasteries are active religious sites, these corpses are considered sacred and miraculous. Consequently, ecclesiastical authorities limit access to mummies. For example, access to the corpses of the AM is restricted due to internal monastery rules. Whereas the federal government permit does not require compliance with the monasteries, it strongly encourages cooperation. Any attempt by government officials to interfere and enforce permits is regarded as an infringement on their religious freedom. As stipulated, the monetary permit only allowed me to look at mummies for three days for the purpose of this scientific study. Nevertheless, I was not allowed to touch, x-ray, or take samples of any kind. To make matters worse, a committee of six individuals was organized by church authorities to ensure proper adherence to the monastery and EOC

rules, and it was the responsibility to pay a per diem to each committee member. In reality, this financial burden was imposed to discourage researcher and limit access to mummies. At the end of the three days, I requested an extension, which was denied. Consequently, in collaboration with government and religious officials, I had to investigate the DS cave church to supplement fieldwork data. Fortunately, like the AM, numerous mummies are preserved in the DS cave church. While the excavation of the burial grounds provided valuable clues about the in situ deposit, the bodies exhumed from the site were reburied without any examination.

Third, sample extraction was another challenge during the multi-season field data collection. Formal requests for research samples were a primary factor that strained my relation with the AM cave church involved the. The priests and ministers in the church either misunderstood or deliberately misinterpreted the request. Although several attempts were made to convince them, efforts were unsuccessful. Hence, no sample was collected from either the AM or Lalibela, and the researcher failed to obtain any surface finds for AMS carbon dating and isotope analysis. Therefore, all samples for this study are surface collections from the DS and YK. Also, a major limitation of the study was the sample sizes collected for lab analysis and the difficulty of getting portable X-ray machines.

The researcher discussed the lengthy bureaucratic machinations with the ARCCH officials. Permit procedures needed structural adjustment to eliminate unnecessary bureaucratic requirements. It is recommended that the ARCCH revise its guidelines to address the issue. Regional states should not regard direct ARCCH permits as infringing on their power. A single copy of ARCCH permit to the region, zone

and woreda would have alleviated regional government concerns and eliminated most bureaucratic obstacles experienced by the researcher.

### **Structure of the Dissertation**

The structure of this dissertation is organized into eight chapters. Following this introductory chapter, Chapter 2 provides an overview of current research on the history of mummification in Egypt and Nubian. The purpose of this chapter is to contextualize mummies and the practice of mummification in northern and central Ethiopia to the broader regional studies in Africa. Despite the presence of thousands of well-preserved mummies in Ethiopia, scholars have given them little attention, which has created a knowledge gap. As a result, there are few direct studies on mummification tradition from the Horn of Africa, but tapping to major mummification studies in Egypt and Nubia potentially provide insightful information. The chapter also explains the origin and practice of mummification in Egypt and Nubia. Given the prolonged Nile Corridor contact, and the Aksumite kingdom territorial aggrandizement to Meroe, the prolonged Christian solidarity between Egypt and Ethiopia could have played a significant role in the cultural exchange.

This study revealed that there were similarities and differences between Egyptian and Nubian, and Ethiopian mummification practices. Some of the similarities related to the orientation of Pharaohs hand, eviscerations of innards, materials used for mummification and deep-rooted Christian solidarity for more than one thousand and six hundred years. Eviscerations of internal organs observed in both ancient Egypt and medieval Ethiopia, but the meanings attributed to the arrangement of them as well as the ideologies of life after death, were completely different. As a result, it attempts to lay

background data useful to carry out a comparison between the northeastern regions of Africa.

Chapter 3 attempts to contextualize the historical, archaeological work done in Ethiopia and Eritrea to understand the role of priests during the ancient and medieval periods in Ethiopia. Priests are closely connected in multiple ways with the introduction of Christianity, carving of cave churches, and the mummification practice in the country. Christianity was introduced in Ethiopia in the 4th century during the reign of King Ezana (Sergaw 1972). Frumentius consecrated by the Egyptian Coptic patriarch in Alexandria. Consequently, the EOC was under the hegemony of the Coptic Church of Egypt from 340 AD to 1959 AD (Sergew 1972).

The introduction of Christianity consolidated the tradition of monasticism, contributed to the development of mummification where the ruling class used it as a tool to maintain their power over the majorities of the peasant society in ancient and medieval Ethiopia. Consequently helped to promote centralization and create Christian civilization in Ethiopia and Eritrea.

The origin of mummification in Ethiopia and Eritrea was unknown. However, it might be introduced during the early Judaic monastic life in Ethiopia. The practice expanded during and after the arrival of the Nine Saints. Thus, mummies were scattered widely in space and time.

Chapter 4 provides a historical background of the cave monasteries and mummies in Ethiopia. The geoarchaeological setting of northern and central Ethiopia are briefly summarized to contextualize cave formation and layout the regional climatic condition, which is crucial for the preservation of mummies. A physiographic setting of

the region is also explained to provide background information regarding location, topography and present demography of the study area. The chapter also gives summary background information about mummies and mummification in the study of the archaeological sites namely the YK, AM and DS.

Chapter 5 details the archaeological field methods including pre-field reconnaissance surveys, archaeological surveys, and excavations from the study sites. After reconnaissance's survey, three cave sites were selected. Archaeological surveys were carried out in the YK, AM and DS, but excavation was only conducted in the DS.

Chapter 6 details the bioarchaeological and osteological methods followed by physical anthropological analysis of data presentation of the inventory. A total of 221 mummies documented from the AM, DS and YK cave monasteries. Of the total 221 mummies, 40% were recorded from the YK in northern Ethiopia. The rest 31 and 29% were documented from the AM and DS in central Ethiopia.

Chapter 7 further details archaeological and lab analysis results to integrate multiple lines of data to carry out comparative analysis. The mummification practice was compared with the Konso mummification tradition. Additional comparisons about the mummification practice in Ethiopia were carried out with the surrounding Nubia and Egypt.

Chapter 8 concludes the dissertation by returning to the outlined objective to explain the data from the YK, AM and DS may reveal about the mummification practice and the role of priests in the medieval Ethiopian society.

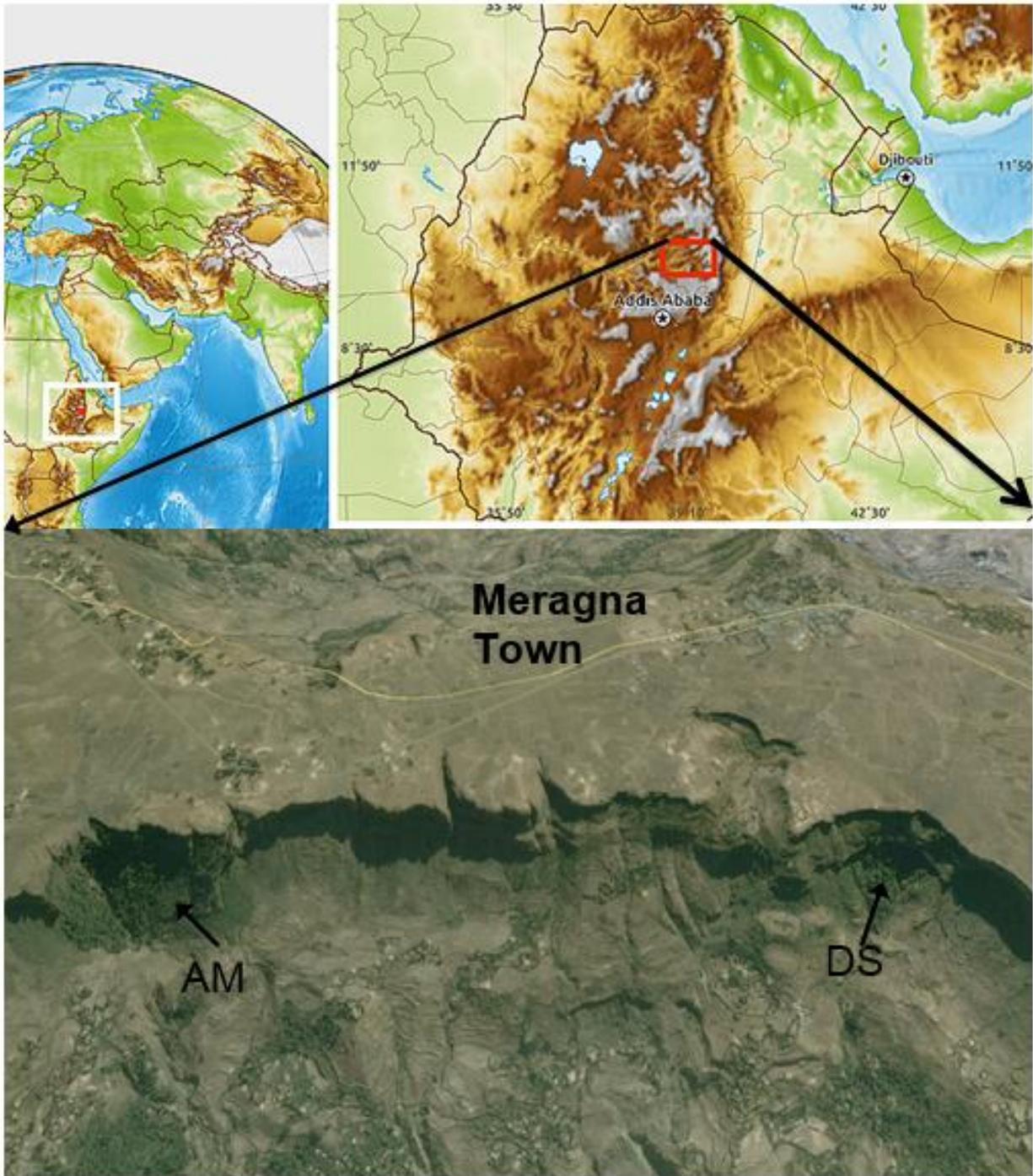


Figure 1-1. The AM and DS study sites in central Ethiopia: the small red square shows the relative location of the Meragna town and the surrounding area in Mida Woremo district in Northern Shewa: the AM and DS point to narrow strips and forest coverage of both cave monasteries. 836 stairs are constructed to reach to the AM cave monastery. No stairs are constructed for the DS. (Source: Modified from Maphill and Google Earth 2016)

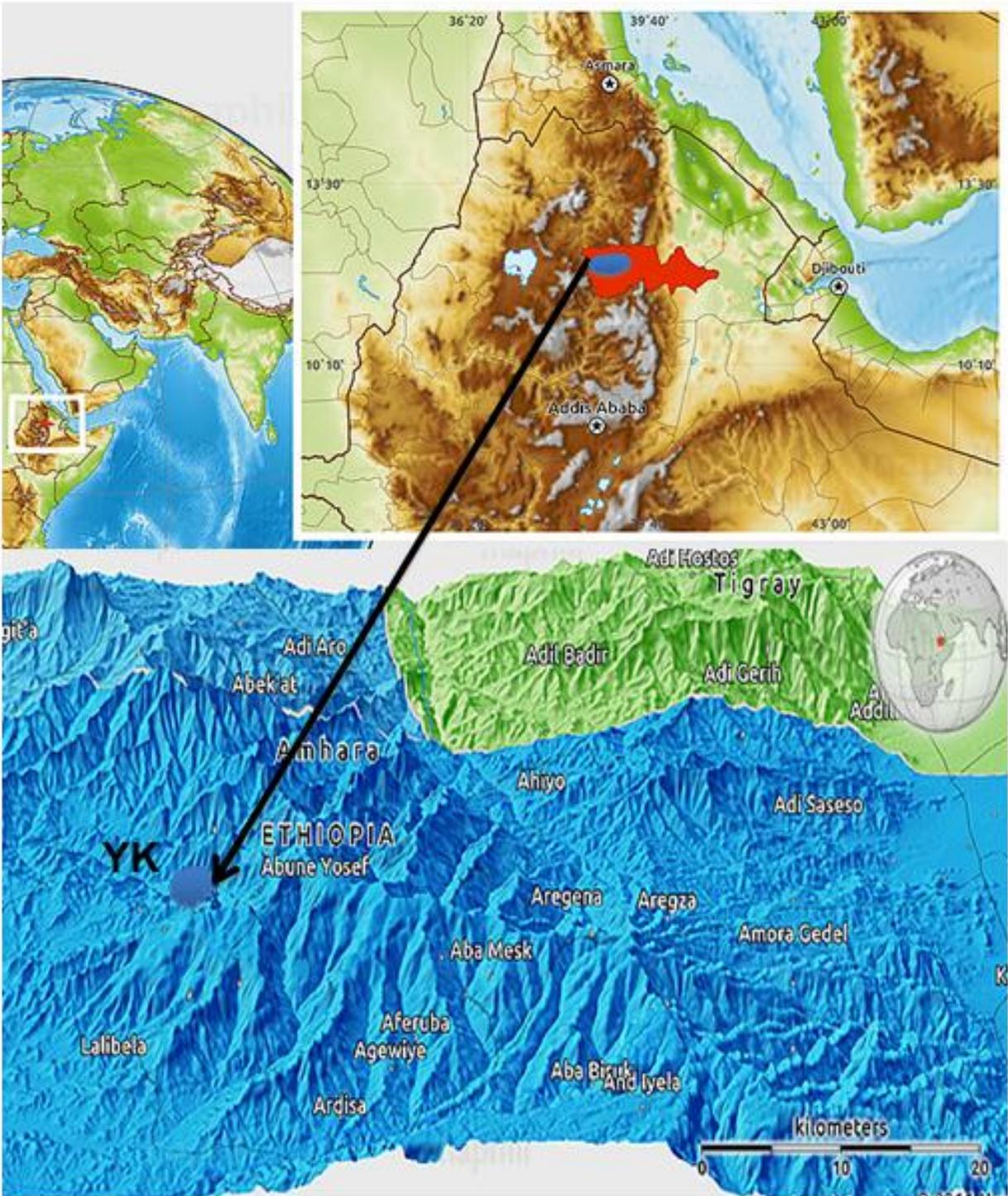


Figure 1-2. The YK study site in northern Ethiopia. Northern Wello is colored in red while the bottom map shows the physical map of the DS, located at the base of Abune Yosef Mountain. (Modified from Maphill 2016)

## CHAPTER 2 HISTORY OF MUMMIFICATION IN EGYPT AND NUBIA

Chapter 2 provides an overview of current research on the history of mummification in Egypt and Nubian. The chapter presents previous research results from northeast Africa to contextualize mummies and practices of mummification in northern and central Ethiopia to the broader regional studies in Africa. The chapters also cover about cover processes, materials, and motifs of mummification in ancient Egypt and Nubia.

### **Etymology of Mummy and Mummification**

Previous studies have demonstrated that the term mummy is explained from different perspectives based on the diversity of mechanisms used in mummification to preserve a deceased body. (Aufderheide 2003; Carney 2009; Chamberlain 2003; Cockburn et al. 2003, Ikram 2013; Jeremiah 2014; Lynnerup 2007). There is no consensus definition for the term mummy. Common definitions of mummies and mummification are presented below.

A mummy is a well-preserved human with soft/non-bony tissue (Lynnerup 2007, 12). According to Aufderheide (2003) and Chamberlain (2003), it is a body intentionally preserved for a prolonged period. A mummy is also defined as a human or animal preserved body that has undergone an accepted ritual practice of a given society (Chamberlain, 2003; Cockburn et al. 2003). The ancient Egyptians ceremonially preserved a corpse with deliberate removal of the innards (lung, intestine, stomach and liver); the body was treated with natron and with linen to maintain the body's structural integrity for an extended period (Ikram 2013; Jeremiah 2014). As a result, the soul (ba and ka) could have a body for the netherworld (Maskoud and Amin 2011; Ikram 2013).

Barakat et al. (2005), Cockburn et al. (2003), and Jeremiah (2014) point out that the word mummy is derived from a Persian word "Mamiya", commonly referred to as "asphalt/bitumen." Bitumen is a black, asphalt-like substance, imported from the Middle East - possibly Persia - that was used as an ingredient to preserve a body in Ancient Egypt. Nissenbaum (2013) adds that bitumen was an important traded good exported to Ancient Egypt for the purpose of mummification.

The first application of the word mummy was in 1615 (Cockburn et al. 2003). During the medieval period, it was believed that black corpses covered with a bitumen substance have medicinal values (Nissenbaum 2013). It was thought to have cured many ailments, and many believed that a Mumiya has "the magic healing power of death" (Scholz-Bottcher et al. 2013, p. 1). Hence, the demand for mummies for therapeutic purposes increased "medicinal cannibalism" (Scholz-Bottcher et al. 2013, p. 2) and ultimately led to the destruction of numerous mummies.

People in Ethiopia also believed that mummies had pharmaceutical ingredients and spiritual healing powers. The local population in the DS and AM thought that eating the part of the body that was believed to possess the ancestral spirit could fight disease or evil. Accordingly, numerous mummies were destroyed and reduced to mostly skeletonized human remains. Such interventions complicated the definition of "mummy" by turning corpses into skeletons.

Mummification refers to the whole process of embalming the deceased artificially or naturally to accomplish a burial rite (Ikram 2013). Natural and artificial mummifications are the two most commonly known forms of mummification. Aufderheide (2003) defines artificial mummification as a deliberate intervention and use

of preservatives to preserve a deceased person. The process involves eviscerating the internal organs, treating the body with bitumen, and wrapping it in cloth. This kind of extensive mummification was at first reserved only for pharaohs, the ancient rulers of Egyptian.

In this dissertation, the term mummy is applied to human bodies whose soft tissue was preserved either by natural or artificial means or by a combination of both.

### **Previous Works on Mummies and Mummification in the Egypt and Nubia**

Studies regarding mummies were conducted in ancient, medieval, renaissance, industrial revolution and during the modern period. First, the earliest study of mummification based on historical records was from the 21<sup>st</sup> Dynasty of ancient Egypt that revealed the ancient Egyptian embalmers, who were believed to undertake mummification studies to perfect their skills, rewrapped royal mummies (Abeer 2010). It is believed that their perfection affects the mummification practice during the Nubian rule of Egypt in the 25<sup>th</sup> Dynasty and later. However, Herodotus and Diodorus, who were ancient Greek historians and philosophers, reported the most popular contemporary studies of mummification in ancient Egypt. They wrote a detailed account regarding embalming techniques used by ancient Egyptians (Aufderheide 2003; Cockburn et al. 2003; Koller et al. 2005). Herodotus' account provides insight regarding burial practices, cost variations and mummification techniques. Four centuries after Herodotus, Diodorus wrote about three distinct burial practices in ancient Egyptian society that differed mainly by the cost of mummification: the expensive process, the affordable, or "medium," process, and the cheap process (Aufderheide 2003; Carney 2009; Cockburn et al. 2003).

Scholars have carefully examined and scrutinized the reports of Herodotus and Diodorus. Koller et al. (2005) argue that the data provided by Herodotus regarding the materials used for embalming are similar to their archaeological findings on ancient Egyptian mummies. On the other hand, Wade and Nelson (2013) carried out research on “Radiological evaluation of the evisceration tradition in ancient Egyptian mummies” which debunks the classical records as unreliable. Their more recent study highlights variability and inaccuracy in classical reports. The practice of brain removal, heart preservation and the use of cedar oil were not prevalent among Ancient Egyptian embalmers, as reported by the studies of Herodotus and Diodorus. Regardless of their limitations, the accounts of Herodotus and Diodorus are still necessary to crosscheck newly discovered materials and methods. The Greek accounts of mummification help to supplement future studies on Egyptian mummies.

Second, studies of mummies were intensified in the medieval era in Europe mainly due to a medicinal purpose of mummy powder. The healing power of the powder might have been related to the use of bitumen, as ancient Egyptian and Nubians used the substance to embalm their dead. The shortage of bitumen or *Mamiya* in medieval Europe was resolved by the unlimited supply of mummies from ancient Egypt and Nubia. The production of mummy powder led to the destruction a countless number of mummies, which was referred to as the “Dark Age” in the study of mummification.

Third, the study of ancient Egyptian and Nubian mummies was revived during the renaissance. The classical accounts of Herodotus and Diodorus were sources of knowledge regarding ancient Egypt mummification, mainly to understand the logic behind the ancient Egypt and Nubian mummies’ healing power.

Fourth, during the industrial revolution, scholars from France, Britain and Italy further resuscitated the study of mummification by the French scholars. For example, Rouyez, who was a member of Napoleon's expedition, published "*Description de l'Egypte*" which was the first scientific work on mummification. Other notable travelers and explorers who reported about the practice of mummification in Egypt and Nubia include Guillaume-François Rouelle, Henry Salt, Augustus Bozzi Granville and Thomas Pettigrew (Pettigrew 1834). Rouelle examined compounds used to embalm Egyptian mummies. Henry Salt, a British Consul General, in Sudan reported on mummies and sculptures in Egypt and Sudan they paved the way for the exportation of mummies from Egypt to Britain. Granville pioneered proper medical mummy autopsy in 1825 (Pettigrew 1834). Thomas Pettigrew, the author of a "*History of Egyptian Mummies*", famously unrolled an Egyptian mummy and played a crucial role in elevating the understanding of science, history, art, medicine and archaeology (Pettigrew 1834). Pettigrew, through his antiquarian practices, began to bring greater scientific attention to mummies. These practices, although ultimately destructive, helped to lay the ground for more modern studies.

Fifth, foundational studies of modern research on mummies began at the onset of the 20th century. Cockburn et al. (2003) state that the beginning of the scientific studies of bodies coincided with some significant events that facilitated the study of ancient Egyptians (Chamberlain 2003). Grafton Elliot Smith, Alfred Lucas and Armand Ruffer laid the cornerstone of mummification studies in Egypt (Cockburn et al. 2003). Alfred Lucas, a British chemist, carried out chemical analyses to determine the substances applied to Ancient Egypt mummies. Lucas contributed significantly to the

scientific studies of mummies with his examination of the mummy of Tutankhamun (Hawass 2005).

The establishment of the World Mummy Congress in 1995 brought attention to mummification studies and facilitated the sharing of hundreds of years of data, which would not have been possible otherwise (Cockburn et al. 2003).

### **The Origin of Mummification in Egypt**

Egypt and Nubia (currently known as Sudan) are found along the Nile valley in North Africa. The practices of mummification are more or less similar throughout the region, as both were politically and ideologically aligned. A summary of Ancient Egyptian mummies and mummification practices follows.

#### **Neolithic to Early Dynastic Mummification (c.5000-2686 BC)**

Discoveries of mummies at Merimda Beni Salama (Heath 2015, p. 13), a prehistoric town, found northwest of Cairo, indicate that Egyptians buried their dead in shallow pit graves. The desert permitted natural, spontaneous mummification to occur (Cardin 2015, Taylor 2011). Mummies discovered in a fetal position seemed to improve the rate of preservation. The orientation of Egyptian mummies was to facilitate future resurrection (Taylor 2001). The Gebelein Predynastic mummies also known as the six naturally mummified human bodies, dated back 5500 years. Wallis Budge discovered them in the late 19th century (Andrew 1984; Cardin 1984; Dunand Lichtenberg 2006). Nicknamed for its red hair, “Ginger” was discovered in a shallow pit burial grave at Gebelein in Upper Egypt (Dunand Lichtenberg 2006, p. 20). The shallow pit grave proved to be an excellent environment for the lifeless body to desiccate and preserve.

During the Predynastic Period, before 3100 BC, Egyptians attempted experimentation with artificial mummification by using their knowledge of food

preservation. To explain, ancient Egyptian fishermen knew how to preserve their fish. When salt was placed inside an eviscerated fish, it dried quickly. The ancient Egyptians applied the same technique to their deceased individuals. Even though evisceration of internal organs and wrapping had existed for a long time, this was seldom used, mainly because natural mummification was much more efficient than artificial mummification.

Artificial mummification was more widely practiced after the Second Dynasty. Shaw (2003) and Taylor (2011) stated that mummies uncovered from Saqqara, Abydos and Hierakonpolis from this period demonstrated the use of resin-soaked linen to preserve the mummy's physical appearance. Wrapping fragile external body parts and redressing the deceased became common practice during the Second Dynasty. The body of King Djer, dated to the First Dynasty, was found at Hierakonpolis and buried with exotic ornaments, a clay mask, and amulets. These interred objects were believed to protect the king in the afterlife. Recent studies by an international team from the British Museum discovered a new tomb in Hierakonpolis (Van et al. 2015) where an ivory statue, clay mask and other artifacts demonstrate the inclusion of objects as part of the funerary ritual in the Predynastic Period. The practice of mummification incorporated material and technical modifications at the end of the Predynastic Period. During this time, embalmers also continued to conduct mummy experimentation to improve the quality of mummification. The intention was to attain the highest expected resemblance between the deceased before death and the mummy to enable the soul to recognize its body later (Van et al. 2015).

### **Old Kingdom Mummification (c.2686-2160 BC)**

The principle of life after death primarily benefited pharaohs although the idea of life after death informed every aspect of ancient Egyptian society (Shaw 2012).

Egyptian embalmers found new and creative ways to improve and perfect the mummification process. The intent was to reflect the power of the deceased over the living. Brewer and Teeter (2008) state that mixing ingredients, such as natron, with salt and adding other substances, were experimental techniques in the Old Kingdom. Nevertheless, the intended results were not achieved, particularly in removing wrinkled skins, deformed body parts and the dark color (Taylor 2001). Embalmers addressed the challenge by refilling the thoracic and abdomen cavities with linen, sand and other materials. As a result, evisceration became standard practice and the burial position changed from the fetal to the fully extended position.

The mummy of Queen Hetepheres I, the mother of Khufu (c.2589-2566 BC) offered the first evidence of known evisceration in the Old Kingdom (Shaw 2012). The wrapped internal organs were placed in four canopic chests (later replaced by jars). Unfortunately, the queen's body was not found in a sarcophagus (Shaw 2012). Canopic jars were commonly used to preserve the intestines, lungs, liver and stomach during the time of the Old Kingdom. In ancient Egypt, the heart was the most important organ and was not removed from the body because it was considered the source of human wisdom, memory, love and emotion. The brain, on the other hand, received little attention from ancient Egyptians; and as a result, was often removed.

The practice of execerebration (brain removal) was attributed to the Egyptian ignorance of the brain function (Andrew and William 2012). The embalmer removed the brain transnasally or transthemodnally. Shattered nasal apertures and ethmoid bones discovered provided evidence for this type of removal (Andrew and William 2012; Nigel and Helen 2011). This process was a crucial aspect of Old Kingdom true

mummification. Jones et al. (2014) mentioned that true mummification began during the period of the Old Kingdom in Ancient Egypt.

### **First Intermediate Mummification (c.2160-2055 BC)**

The First Intermediate mummification marked the end of body modeling and the beginning and expansion of the cartonnage mask (Aufderheide 2003). A cartonnage, which was a funerary mask, composed of layers of linen or papyrus to covers the mummy's head epitomized this period. Shaw (2012) explains the practice of desiccation using natron and occasional evisceration of transabdominal removal of internal organs. However, in some cases, the embalmer impregnated the body with liquid to dissolve the organs. Aufderheide (2003, p. 227) mentioned "the termination of modeling body surface features onto an outer layer of resin covering the mummy's wrappings" as typical of First Intermediate Period mummification. Lichtenberg (2006) and Taylor (2011) mention also molding the body into a virtual statue of a deceased individual.

### **Middle Kingdom Mummification (c.2055-1650 BC)**

The Middle Kingdom witnessed diversification and expansion of mummification practices, partly attributed to political stability and foreign interactions with Nubians, the Middle East and the Far East. However, mummification was inefficient, and a mummified body seldom survived (Shaw 2000, p. 170). However, mummies of this period were wrapped with bundles of linen sheets to protect the body from external danger.

Abdominal evisceration, canopic jars, and amulets were commonly employed. Ventral evisceration was similar to that of their predecessors of the Middle Kingdom. However, canopic jars evolved from a flat or domed shape into anthropomorphic shapes. Amulets were used to beautify mummies.

## **Second Intermediate Period Mummification (c.1650-1550 BC)**

The practice of mummification during this time declined partly because of Hyksos invasion and rule (Shaw 2012). Cadavers were prepared for burial in a flexed position. The position of the arms varied over time. During this period, the arms were placed straight, or in the Osirian style. Osiris was the god of Egypt and head of the underworld. The position of the arms indicated the social status of the deceased.

## **New Kingdom Mummification (c.1550-1069 BC)**

During the New Kingdom, mummification practices were standardized and reached a climax mainly with the implementation of innovative styles. The standardized procedure applies to the transabdominal evisceration, brain removal, and warpping and placing the internal organs in canopic jars. Transabdominal evisceration was the common form of innard removal. Wade and Nelson (2013) mentioned that eviscerations for elites and men began earlier than for women and commoners. For women, evisceration started during the New Kingdom while for commoners' evisceration started during the intermediate periods. Transabdominal evisceration was conducted by cutting the abdomen on the left side. The ventral incisions contributed to the shift of burial position from flexed to an extended position, facilitating removal of the innards (Wade and Nelson 2013).

Brain removal became common practice during the New Kingdom, particularly during 18th to 20th Dynasty, (c.1550-1070 BC). Postmortem transnasal brain removal continued until the Greco-Roman Period (332-641) (Andrew and William 2012). David (2008) and Daunand and Lichtenberg (2006) mentioned the widespread practice of transthemodial and transsphenoidal removal of a brain. The remaining brain tissues

were removed using drugs that dissolved them. However, scholars have not yet addressed what might have happened to the brain after removal.

Wrapping techniques and decorated canopic jars became emblematic of the New Kingdom. Wrapping techniques became elaborate as each body part was wrapped carefully before the entire body was bandaged together. Canopic jars became associated with the four gods of Egyptian religion. Each god was responsible for the innards placed inside his or her respective jar: Hapi, with the baboon-headed jar, was accountable for the lungs; Imsety, with the human-headed jar, was responsible for the liver; Duamuter, with the jackal-headed jar, was accountable the stomach; and Qenehsenuf, with the falcon-headed jar, was responsible for the intestines (Taylor 2011). In the New Kingdom, numerous amulets were used to decorate a deceased individual. With the Tutankhamen mummy, for example, more than 40 charms were placed on the body of the king. However, Ushabits, a funerary figurine, substituted amulets at the end of the New Kingdom.

During this period, ancient Egyptian cartonnage masks also evolved. The oldest archaeologically known mask was dated to the Predynastic Period and gradually developed to mark social status. The higher class used highly decorated gold-and-blue masks while the commoners wore the cartonnage masks.

### **Third Intermediate Period Mummification (c.1069-664 BC)**

The practices of mummification during the Third Intermediate Period were relatively similar to those of the New Kingdom. During this period, external mummy beautification became more frequent. The physical appearance of the deceased received significant attention to make the corpse as lifelike as possible. The mouth was stuffed with sawdust, linen, butter and mud to protect the face from collapsing.

Artificially engraved stones were also inserted into the mummy's eye cavities to capture the real image of the deceased.

The Third Intermediate Period signaled changes in the viscera, where innards were left untouched. The retention of the innards also suggested that the practice of eviscerating might not have been necessary at this time. The cartonnage case emerged during this period and eventually replaced the wooden mummy boards that had come into use during the New Kingdom and eventually disappeared. External beautification of the cartonnage cases and mask became a standardized practice for the later periods in Ancient Egypt.

### **Late Period (c.664-332 BC)**

During the Late Period, mummification practices were highly simplistic, and mummies were poorly prepared. Although excerebration was abandoned, the practice of transabdominal evisceration continued, and innards were placed in the canopic jars, which were also widely used during this period. However, the jars were not sophisticated as the New Kingdom jars. Greater attention was instead given to the external decoration of the cartonnage cases, which were decorated in a sophisticated manner (Taylor 2011).

### **Ptolemaic Period (c.332-30 BC)**

During the Ptolemaic Period (c.332-30 BC), with the conquest of Alexander the Great and expansion of the Hellenistic customs, mummification took different forms and roles. Taylor (2005) mentions that the removal of the brain was revived during the Hellenistic Era. Nevertheless, the use of canopic jars, amulets and wrapping practices evolved. Painted canopic chests replaced canopic jars. The use of amulets declined. The design of wrapping techniques changed to reflect Hellenistic custom and culture.

The principle of life and death that was the central purpose of mummifying the deceased gradually gave way to the Greek tradition. As a result, the practice of mummification, which was limited to the elite, was extended to commoners, partly to erode the culture of mummification and the ideological meaning attached to it. Nevertheless, the effort of eliminating the Egyptian mummification tradition was not successful. In fact, many ancient Egyptian practices were amalgamated with the Greek and later with the Roman and Coptic era of mummification.

### **The Roman Period Mummification (c.30-395 AD)**

During the Roman Period, the sophistication of mummification practices eventually declined. The expansion of Christianity in Egypt gradually weakened the Egyptian polytheism and the principle of life after death. The Romans also adopted mummification for the higher classes. However, the friction between the Hellenistic and the Egyptian cultures caused ideological shifts of mummification from its association with the pharaohs to the commoners. The practice of mummification became commercialized. Consequently, the spiritual dedication cause to mummification gradually gave way to signifying social status. Thus, the quality of mummification reached all-time low during the Roman Period. Nevertheless, external beautification became the primary target rather than mummifying the actual body. Thus, an external appearance of the deceased was detailed and elaborated with geometrical patterns to reflect social status (Dunand & Lichtenberg 2006; Taylor 2011).

### **Coptic Period Mummification (c.395-641 AD)**

The Coptic Church of Egypt did not officially endorse the practice of mummification. However, the Copts retained the practice until the 8<sup>th</sup> century. Evidence of Coptic mummification were uncovered from Karara, Antinoopolis, Akhmîm, Thebes,

and Aswan dating between the periods of the 5<sup>th</sup> to 8<sup>th</sup> centuries. Some of mummies recovered from this period show the impact of leprosy. Similar cases were found in Ethiopia (Chapter 7) Egyptian Copts retained the mummification techniques of the Roman Period.

Hawass (2000) argues that the rise of Christianity was not a factor for the decline of mummification practices in Egypt. The practice of mummification was not banned in any biblical text. Rather, the practice of mummification declined partly due to the impact of monasticism, where monks denounced the tradition. The termination of mummification was often associated with the conquest of Arabs. As a result, the practice of mummification during the Islamic period was rolled back to the beginning, natural mummification, where the body was wrapped with a cotton sheet and buried in a shallow grave. The deceased was buried immediately after death, where the body become desiccated and was preserved.

### **Mummification in Nubia**

Discussion about the origin and historical development of Nubia is beyond this dissertation. Thus, my focus is limited to mummification practices in the area rather than its genesis. Nubia, located in the present day Sudan and Egypt, found along the Nile corridor was under the control of Egypt during the 23rd Dynasty (c.818-715 BC). Egyptian pharos expanded the practice of mummification in Nubia. Later, during the 25th Dynasty (c.760-656 BC), Nubia conquered Egypt. As a result, there was no significant change in the mummification practice. Lucas (1914) reported the presence of well-preserved and prepared mummies using bitumen, similar to Egypt.

## **Materials Used in Mummification**

Maksoud and Amin (2011) have conducted a review of the materials employed in the mummification of ancient Egyptians to attain a higher degree of preservation for a longer period. Some of the primary materials used in mummification included frankincense, myrrh, beeswax, natron salt, coniferous resin, cassia, onions and lichen.

### **Aromatic Substances**

Frankincense, also known as olibanum, is an aromatic gum resin extracted from trees of the genus *Boswellia* (van Bergen 1997). Scholars studied frankincense (Evershed et al. 1997; van Bergen 1997; Mathe 2004) focusing on history (van Bergen 1997), archaeology (Evershed et al. 1997), geographical distribution (Ogbazghi 2006), chemical components (van Bergen 1997 and application (Groenendijk 2012; Mathe 2004). Frankincense is economically and culturally valuable product used for medicinal, incense, hygienic, insecticide, cosmetics, perfumery and others purposes (Groenendijk 2012; Lemenih 2005; Mathe 2004). For example, frankincense is known in several countries for its medicinal properties and has been used in the treatment of cancer, leprosy, mouth ulcers, and infections.

Frankincense was an important trade commodity between Ethiopia, Meroe, Egypt and South Arabia (van Beek 1958). Van Beek (1958, p. 150) reports that the Sabaeans controlled and monopolized frankincense sourcing and trade during the 4th century BC. However, the earliest archaeological evidence for using frankincense comes from the Old Kingdom in Ancient Egypt (van Bergen 1997). The ancient Egyptians also used frankincense for the purpose of embalming mummies (Abdel-Maksoud and Amin 2011). The resinous substance also has aromatic and adhesive properties (Hamm et al. 2004).

Myrrh is another aromatic gum resin extracted from trees of a particular Commiphora species of the Burseraceae family (Abdel-Maksoud and Amin 2011). It comprises the resin myrrh (23-40%), the volatile oil myrrh oil (2-8%), gum (40-60%) and a bitter unidentified component (Hamm et al. 2004, Abdel-Maksoud and Amin 2011, p. 138). Ancient Egyptians used it as a fragrance, medicine, and for embalming the deceased. It was imported from Ethiopia (van Beek 1958). Queen Hatshepsut imported herbs, myrrh resin and myrrh trees, ebony, frankincense, and other woods from what was then known as the Punt land (Bard and Fattovich 2013). The location of the Punt was unknown. However, according to Professor Salima Ikram and Professor Nathaniel Dominy research on a mummified baboon in the British Museum, the ancient land of Punt was located Ethiopia and Eritrea (press release) ending the debate on the geographical location of the Punt.

Myrrh was a commonly used ingredient “during the New Kingdom to stuff and massage on and into mummies” (Abdel-Maksoud and Amin 2011, p. 138). It was a valuable product because of its fragrance, which was applied to the bodies during embalming. Hamm et al. (2004) carried out chemical analysis to determine that ancient Egyptians put myrrh on mummies and confirmed the presence of the substance in Egyptian mummies. Myrrh was also used in Ethiopia to eliminate bad odor, particularly soon after death.

### **Adhesive Substance**

Beeswax is extracted from the honeycomb of honeybees. It was imparted to the bodies of ancient Egyptians during the mummification process to glue deceased bodies together. It also has an antibacterial substance that deters the growth of microorganisms.

Serpico and White (2000) stated that beeswax was applied to mummies from the Late Period to the Roman Period. The ancient Egyptians preserved mummies more than 6000 years ago by soaking the wrapping material in beeswax (Abdel-Maksoud and Amin 2011; Goffere 2007). The Konso people in Ethiopia were also known to use beeswax to mummify the dead bodies of kings or chiefs. The wax served as an antibacterial agent and helped to preserve the body for nine years (Chapter 3).

### **Deterrent Substances**

Natron salt was used to dehydrate water from the corpse to arrest biological activities and initiate petrification of the corpse (Edwards et al. 2007). Natron salt is the subject of an investigation to understand its role in artificial mummification (Abdel-Maksoud 2001; Edwards et al. 2007; Cosmacini and Piacentini 2008). All of the authors agree that the sodium bicarbonate compound found in the natron was crucial to the petrification process and used as a deterrent against body desiccation.

Egyptians placed coniferous resins from the juniper tree into the body to stabilize the soft tissue and arrest microorganism. Buckley and Evershed's (2001) chemical analysis of Egyptian mummies found traces of cedar wood oil and juniper tree branches. According to Maksoud and Amin (2011), the coniferous resins included pine oil, cedar wood oil, and juniper oil and they reported the presence of juniper cones (*Juniperus Phoenicia* L.) in ancient Egyptian graves. The application of juniper was more pronounced during the First Intermediate Period. Similar tree branches were used to preserve the mummified priests in central Ethiopia's cave churches.

Cinnamon (*Cinnamomum cassia*) has natural preservative properties and is a scent used for medicinal and spiritual embalming practices. Chemical analysis revealed that cinnamon has been used on mummies since 2600 BC (Maksoud and Amin 2011).

Baumann (1960) states that cinnamon was collected from Punt, the land located in Ethiopia and Eritrea.

Onions (*Allium cepa* L) have a chemical substance that can deter the growth of mycobacteria. Ancient Egyptians used it for food, medicine and the preservation of their dead. Maksoud and Amin (2011) reported that onions were used to fill cavities. David and Arcbold (2000) noted that traces of onions were found in the eye, ears and nose of Ramesses IV, and from the New Kingdom to the Third Intermediate Periods.

### **Classification of Mummies**

Traditionally, mummies were classified into natural and artificial (human) mummification. However, researchers tend to see this typology as a crude and simple classification that does not encapsulate and present the whole spectrum of mummified human remains. Variations in mummification processes and temporal limits complicated mummy typology.

The ranking of mummification was subsequently revised and extended to four different classes. Initially, Aufderheide (2003) in his book, the “*Scientific Study of Mummies*”, classified mummification into anthropogenic (artificial), spontaneous (natural), spontaneous-enhanced and indeterminate. Later, Jeremiah (2014), who has done extensive work on mummies, categorized mummies into four different classes: Class I (natural mummification), Class II (enhanced mummification), Class III (artificial mummification) and Class IV (spiritual mummification). In this dissertation, Jeremiah’s classification is used to improve understanding, to standardize the classification and, above all, to avoid confusion.

Class I mummification refers to natural mummification. Natural mummification defined as the spontaneous preservation of a human body without deliberate human

intervention. Natural disasters can sometimes preserve the bodies of humans and animals. Certain extreme weather condition can inhibit decomposition and enhance preservation. Evidence uncovered from some of the world's coldest regions indicates prolonged postmortem intervals for glacier mummies. The Iceman and Bog Body uncovered from Europe best examples of natural mummification (Rollo et al. 2000; Sanders 1995).

The Tyrolean mummy discovered in the Alps Mountains in Italy was preserved naturally. The Iceman or Otzal, based upon calibrated radiocarbon dating, was dated between 3350-3100 BC. Mountain climbers discovered the Neolithic shepherd/hunter in 1991 in Hauslabjoch in the Otzal Alps. Multiple hypotheses have been proposed regarding the preservation of the Tyrolean Iceman. Rollo and his colleagues suggested that snow and ice covered the Iceman's corpse, which then underwent the mechanism of thawing and desiccation (Rollo et al. 2000). Preserved cloth and tools indicated that the man was a shepherd or hunter who was wounded and eventually died. The cause of death was associated with a sharp stone tool cut mark, which was uncovered from the Iceman's body. It reveals major arterial vessel damage, where the Iceman bled to death. Some scholars believed that the Iceman was artificially preserved in the lower Alps area and taken up into the mountains. In contrast, Bahn (1996) argues that the Iceman was naturally mummified in the same way mammoths and other Ice Age animals were preserved.

Guillen (2004) further elaborates that vast deserts in central and northern Peru do not allow for excellent preservation. Nevertheless, selected places where there are

suitable soil types, mineral content and optimum humidity allow proper preservation of human remains.

The largest African desert, the Sahara, and the South American Atacama Desert have conditions that ensure the preservation of organic materials (Gullien 2004). The Great East African Rift Valley also permits excellent preservation of organic substances. These show that no single factor determines the rate of preservation. Sites and mummified remains must be analyzed contextually to determine how that environment allows preservation.

The dry and hot environmental condition in Egypt coupled with a suitable soil types impedes the growth of microorganisms and allows rapid desiccation. Recent studies unveiled millions of naturally mummified human remains in Egypt. Similar environmental and soil types in Ethiopia facilitated spontaneous mummification from ancient times to the present. Many groups/cultures mummified their dead and knew how the local environment would affect the bodies.

Class II mummification refers to intermediate mummification, where extreme weather conditions occurred in tandem with the purposeful exploitation of natural processes to halt internal and external decomposition. Refer to page the scientific study mummies (Aufderheide 2003). Scholars argue that mummification initially mimicked nature. Human or animal remains intentionally or unintentionally left in extreme weather conditions were quickly dehydrated which hampered both internal and external factors that could decay the dead body.

Jeremiah (2014) referred Class II as early forms of intentional mummification. For instance, ancient Egyptians used their knowledge of natural mummification to preserve

and prepare their dead body for the afterlife. Hence, natural mummification was the cheapest form of mummification, and ordinary people used natural mummification to reduce the cost of artificial mummification (Aufderheide 2003; David 2001; Dunand and Lichtenberg 2006; Salter-Pedersen 2004; Taconis 2005; Sivrev et al. 2005).

Class III mummification is artificial mummification caused primarily by human intervention to preserve the body. Recent scholarly work suggests that artificial mummification in Egypt began earlier than previously thought. Jones et al. (2014) report evidence on the prehistoric origin of Egyptian artificial mummification. Jones and his colleagues conducted chemical analysis of the organic compounds found in funerary wrappings, skin and reed matting materials from a mummy in a Bavarian pit grave in Egypt, dated to the Prehistoric Period (c.4500-3350 BC). Their investigation revealed the use of artificial resin during this period. This evidence further pushes back the beginning of artificial mummification by millennia.

Artificial mummification of human bodies by ancient Egyptians set the highest standard. Egyptian mummies, compared to mummies around the world, reached their pinnacle during the New Kingdom. However, the practice might have started during the Prehistoric Period and subsequently declined with the advent of the Romans and later with the introduction of Islam to North Africa in the 7th century AD.

Class IV mummification is 'spiritual mummification' refers to mental mummification where the process of mummification started during lifetime. Jeremiah (2014) suggests that Christianity and Buddhism promoted and controlled the "veneration of bodily relics" where whole, or part of, the bodies were enshrined and venerated. Jeremiah states, "spiritual advancement causes mummification" (Jeremiah

2014). The mummified remains became incorruptible, and such bodies were associated with a divine power that performed miracles and kept away the devil.

The challenge of developing a universal classification of mummification partly related to the difference in cultural background, motives of mummification and variation in the rate of preservation Gullien (2004) argues that no single factor may influence the preservation of mummies. Multiple factors govern the rate of preservation. For instance, an extremely hot or cold area does not necessarily guarantee the preservation of human remains to the point where bodies become mummified.

### **Processes of Mummification**

Egyptian mummification has attracted the attention of scholars since prehistoric times (Aufderheide 2003; David 2001). The process of mummification in ancient Egypt could be lengthy, depending on the method selected (Aufderheide 2003; David 2001; Dunand and Lichterberg 2006; Salter-Pedersen 2004; Taconis 2005; Sivrev et al. 2005).

Herodotus reported in 450 BC Egyptian used the three process of mummification that includes the first, second and third processes. Herodotus reported in 450 BC that the ancient Egyptians often used the second, and third-practice. The process by which the mummy was prepared determined the quality of mummification. The first process was believed to be “first quality”: the most expensive and perfect process of mummification (Aufderheide 2003). The second quality process, on the other hand, was affordable to a higher clergy member, and the third process was the poorest quality process and was used for mummification of commoners.

Aufderheide (2003), David (2001), Dunand & Lichterberg (2006), Salter-Pedersen (2004), Taconis (2005) and Sivrev et al. (2005) all elaborate about evisceration and dehydration processes. Most authors agree on the three methods of

mummification but cannot agree on the process and materials used while embalming the body.

Ritner (2005) states that the mummification process was performed with three distinct groups: the Scribe, the Embalmers and the Cutter. The Scribe, who was a supervisor, watched over the mummification process. The Embalmer, who was a priest and member of a guild association, led the mummification process and ritual ceremonies. The Embalmer wore a jackal-headed mask personifying the god of Anubis. The Cutter, who belonged to the commoners group in ancient Egyptian society, carried out transabdominal incision on the dead body.

The mummification process was continually evolving with the introduction of new methods and techniques. Sometimes mummification went through a period of innovation and developed quickly, while at other times, it declined. New techniques were added, and old ones were no longer used. There was no perfect or ideal stage of the mummification process throughout the history of ancient Egypt. For the Egyptians, mummification was just a process to prepare for life after death.

The first type of the mummification process is composed of the ten stages described below. The stages presented are categorized in this way to accommodate the work of various scholars who have worked on one or multiple stages. In some instances, the stages overlap, are redundant, or even precede one another. These stages, nevertheless, are important for understanding the process of embalming.

**Stage One.** The embalmer built a temporary structure near the Nile River Valley, which was believed to be a 'place of purification' and prepares materials needed for

mummification (Taconis 2005). The deceased individual's clothes were removed, and then, cleaning and disinfecting of the body followed.

**Stage Two.** The embalmer began a surgical operation on the left side of the abdomen. Herodotus mentioned the use of Ethiopian stone (obsidian) to perform the operation. The surgical procedure aimed to remove the soft organs: stomach, intestine, liver and lungs to avert internal body decomposition (Taconis 2005). Sivrev and colleagues (2005) indicated that the heart and kidney were purposefully left in the body. The heart was intentionally left in the body, for instance, because it was believed to be the place of feeling, sanctity and intelligence and was needed for the afterlife. The removed soft organs were cleaned and disinfected with resins and spices. The evisceration process was a means to attain a greater degree of preservation. The next process was drying; after that, organs were individually wrapped with linen. Aufderheide (2003) mentioned that the embalmer prepared canopic jars for the stomach, intestine, liver and lungs. Maksoud and Amin (2011) said that the shapes of the lids for each jar were modeled to represent Imsety, Duamutef, Hapi and Qebehsenuef, the four sons of Horus, and the four gods of ancient Egyptian religion.

**Stage Three.** The embalmer removed the brain through the nostril. He inserted a large hook perhaps made of wood and stone, some authors referred to it as Ethiopian stone; shattering the nasal and ethmoid bones to liquefy the brain and eventually drain it out. Maksoud and Amin (2011) reported that brain removal was frequently incomplete.

**Stage Four.** The embalmer refilled the abdomen with proper ingredients such as the natron salt, oils and fragrance to arrest internal and external decomposition of the body (Dunand and Lichterberg 2006). Then, the body was soaked for 70 days to

achieve the much-needed dehydration and preservation of the body. Gradually, as they perfected the process, ancient Egyptians switched from using liquid natron to solid natron to reduce the time required dehydrating the body.

**Stage Five.** The embalmer temporarily removed materials from the thoracic and abdominal cavities (Siverv et al. 2005). He also monitored internal dehydration of the body. Materials found in the thoracic and abdominal cavities included gum-resin, straw and vegetable remains, and sand, which maintained the structural integrity of the body (Maksoud and Amin 2011).

**Stage Six.** The embalmer thoroughly cleaned and disinfected the body, and added fragrance. Taconis (2005) mentioned that the embalmer used water from the Nile River and alcoholic disinfectant and oil to clean and maintain the elasticity of the body skin.

**Stage Seven.** The embalmer refilled the abdominal and thoracic cavities with permanent materials such as myrrh, cinnamon and frankincense. Disinfectants were also applied to deter the growth of microorganisms (Aufderheide 2003; Cockburn et al. 2003; Koller et al. 2005).

**Stage Eight.** The embalmer decorated the face, and occasionally the body. The colors of the decorations depended on the gender of the deceased. Men's bodies were decorated with red ocher while women's bodies were painted with yellow ocher. Elaboration of the face and body was also done using other decorative materials (David & Archbold 2000).

**Stage Nine.** Embalmers put amulets on the bodies. Maksoud and Amin (2011) mentioned that ancient Egyptians used amulets to reflect their religious beliefs in life

after death. It was common practice to place amulets around the neck, waist and limbs at any stage in the mummification process.

**Stage Ten.** Embalmers wrapped the mummy with numerous layers of linen and resinous substances (David and Archbold 2000). A second layer of linen wrapping was required to separate the internal from the external wrapping.

### **Motives for Mummification**

Embalming the dead was not limited to the Chinchorros or Egyptians. It is a universal culture practiced all over the world regardless of race, age, ethnic identity or social beliefs (Jeremiah 2014). Jeremiah further explains that the mechanism of mummification is an innate and universal practice performed on every continent where mankind settles (Jeremiah 2014).

Scholars have written and developed theories about the motives behind mummification. These motives include a religious belief in life after death, political and socioeconomic power, protection from evil and performing a miracle (Aufderheide 2003; Cockburn et al. 2003; Jeremiah 2014; Koller et al. 2005; Taylor 2001). Jeremiah (2014) explains that religion is a fundamental motive for mummification. Artificial mummification in Egypt, for example, was associated with the religious belief in life after death. The principle of life after death precipitates the need to embalm the body for future life – resurrection – for the ancient Egyptians (Taylor 2001).

Maskoud and Amin (2011) stated that the corpse must be preserved in excellent condition for the soul (ba and ka) to recognize it and return to its original being. For instance, the dead bodies of the Egyptian pharaohs are everlasting; the body neither perishes nor decays for ages, signifying the religious importance of mummification (Maskoud and Amin 2011).

Other scholars have explained the motive for mummification as the desire to link between this world and the Netherworld. Mummies were also used as a symbol to mediate the underground world with the other world. Eventually, mummies came to be considered as a link between earthly life and heavenly life (Aufderheide 2003; Cockburn et al. 2003; Jeremiah 2014; Koller et al. 2005; Taylor 2001).

### **Summary**

Previous studies have demonstrated that the term “mummy” is perceived from different perspectives based on the diversity of mechanisms used in mummification to preserve a deceased body. In this dissertation, the term mummy is applied to human bodies whose soft tissue was preserved either by natural, enhanced, artificial or spiritual/mental mummification or by a combination of all. The local population in the DS, YK and AM thought that having a part of the deceased body associated with possessing an ancestral holy spirit that could fight any disease or evil or spiritual healing of followers.

Herodotus and Diodorus reported a contemporary account of the embalming process in ancient Egypt. However, Wade and Nelson (2013) debunked the report of classical records based on their new findings. Regardless of their limitations, the accounts of Herodotus and Diodorus are still necessary to crosscheck newly discovered materials and methods. The Greek accounts of mummification help to supplement future studies on Egyptian mummies. The Egyptian embalming techniques were the most advanced because the process had been perfected by successive dynasties in ancient Egypt. The materials employed in the mummification of ancient Egyptian to attain a higher degree of preservation for a longer period include frankincense, myrrh, beeswax natron salt, coniferous resin, cassia, onions, and lichen (Maksoud and Amin

2011). Similar materials were used to preserve mummies in Ethiopia. In some areas, transabdominal eviscerations were conducted.

Jeremiah (2014) classify mummies into four major classes such as Anthropogenic/artificial, Spontaneous/natural, enhanced mummification, and spiritual mummification. The process of mummification also varies from region to region. The processes of mummification for ancient Egyptian pharaohs were elaborate as compared to the commoners.

Ancient Egypt, Nubia and Aksum were closely connected in various aspects such as trade, cultural, religion, and most importantly shared the Nile River for millennia. This prolonged connection possibly facilitates the way for cultural exchange such as the practice of mummification. For example, EOC was under the Coptic Church of Egypt for more than 1600 years, where the Copts from the 4th to 7th centuries conducted the practice of mummification, which was possibly also extended and expanded mummification practice in Ethiopia and Eritrea.

## CHAPTER 3 HYPOTHESIS OF MUMMIFICATION PRACTICES IN ETHIOPIA AND ERITREA

Chapter 3 presents the oral history relevant in laying the background for the practice of mummification in Ethiopia and Eritrea. The chapter presents the earliest historical, political, commercial and cultural interactions that contributed to the expansion of mummification in the Horn of Africa, particularly in Ethiopia and Eritrea. The chapter also presents the introduction of Christianity to the region and practices of mummification in different part of Ethiopia.

### **Sources of mummification**

The origin of mummification in Ethiopia – based on various oral traditions, historical and archaeological sources – is attributed to three different views, specifically: the north-south hypothesis, the south-north hypothesis and the independent hypothesis. First, the north-south hypothesis posits that the origin of mummification radiated from the north to the south. For example, mummification was practiced in Egypt and gradually due to religious, commercial and political contacts, expanded to Nubia and further south to Ethiopia. Similarly, in Ethiopia, the practice of mummification started in the north and extended to southern Ethiopia. This hypothesis aligns with the broader view that civilization flourished in the north and then expanded into the south. Secondly, the south-north hypothesis, contrary to the first view, states that mummification started in the south and extended to the north. For example, the mummification practice of the Konso people in southern Ethiopia might have been a possible center for the origin of mummification and the tradition might have expanded to the north. It aligns with the origin of humankind where humans originated from the south and radiated to the rest of

the world. Lastly, the independent hypothesis forwards the idea that the practice of mummification began independently in different parts of the country.

### **Traditional sources**

It worth mentioning first that there are limited sources of information about the origin of mummification in the Horn of Africa, especially in Ethiopia and Eritrea.

Traditional sources on the practice of mummification in the region are inconsistent or even contradictory, partially explaining why its origin is dubious in the two countries.

However, in the absence of historical and archaeological sources, they are important in laying the background for further research on mummification. Most of our knowledge regarding mummification is predominantly based on traditional sources, which played a crucial role in forming the customary law that was later incorporated into the Kibre-Negest (Glory of the Kings).

First, the earliest artificial mummification in the country is possibly associated with the introduction of Judaism in Ethiopia. It is stated in the Kibre-Negest that Judaism began during the time of the Queen Sheba and King Menelik I. According to early oral tradition, the Queen Sheba traveled to Jerusalem on a religious pilgrimage and bore King Solomon a son named Menelik. King Menelik I went back to Jerusalem to visit his father, King Solomon. Unfortunately, the clergies were dissatisfied with King Solomon's son (Solomon 2008). As a result, the King declared that the sons of Israelites, including the high priest of the Levites, accompany his son, King Menelik I, to Ethiopia. It was believed that Menelik also brought the Ark of Covenant to Ethiopia, which led to the introduction of a monotheistic practice of Judaism (Solomon 2008). Egypt was perhaps the most viable route to travel to the Middle East particularly to Jerusalem. It is possible

that the knowledge of mummification was shared at this time and the Levites who accompanied Menelik may have expanded mummification into Ethiopia and Eritrea.

Secondly, another historical visit at the highest level where the Ethiopians might have acquired the knowledge of mummification from Egypt was during their religious pilgrimage to Jerusalem at the beginning of the first century AD. According to Ethiopian tradition, a eunuch who went to Jerusalem via Egypt, returned home and evangelized the people, and could have shared the knowledge of mummification, as it played a role in strengthening the power of the ruling class. The Acts of the Apostles: 26-40 details the encounter of Philip the Deacon and the Ethiopian eunuch, who was the treasurer of Queen Candace of Ethiopia, when the former went to Jerusalem to worship the God of Israel. The Ethiopian eunuch met Philip and was believed to be the first to be converted to Christianity (Sergew 1972; Taddesse 1972). Mummification was also practiced in Jerusalem at the time. St. John Chrysostom – who lived in the late fourth and early fifth century – in his Homily on Pentecost, mentions Ethiopians being present in the Holy City (Jerusalem) on the day of Pentecost (Sergew 1972).

Thirdly, the practices of mummification were known at the time because of the cross-cultural contact with Egypt, South Arabia and Asia Minor for millennia. The continuous socio-cultural, political and economic connections enhanced these practices. The long and uninterrupted contact and the role of mummification in asserting the power of the ruling class might have been reasons to keep some of the Judaic traditions. Sergew (1972) argues that Christianity retained some aspects/elements of paganism and Judaism in Ethiopia, mainly due to the prolonged commercial contacts with ancient Israel, Egypt, South Arabia, Greece and the Roman Empire. Roman merchants, who

came to the Aksumite regions, possibly expanded mummification in the region, as Romans and Coptic Egyptians practiced mummification.

Fourthly, Frumentius, who was the first patriarch of Ethiopia, might have also learned more about the tradition of mummification from the Coptic Church in Alexandria, as the church continues this practice. The story begins with Meropius and his two sons, Frumentius and Aedesius, who set out from the port of Tyre on an expedition to India, but disembarked at a port along the African coast of the Red Sea due to a scarcity of logistic supplies (Sergew 1972). Unfortunately, indigenous inhabitants, who were hostile to the Roman citizens, plundered the ship, killed Meropius and captured the two sons (Sergew 1972). Frumentius and Aedesius were spared and handed over to the King of Aksum. They gained the trust of the King; Frumentius was assigned to be treasurer and secretary while Aedesius became the King's cupbearer (Sergew 1972). The sudden death of the King created a power vacuum because his son Ezana was too young to take power. Instead, the Queen mother became regent and asked Frumentius and Aedesius to continue to serve the kingdom until Ezana was old enough take over the role of administration (Sergew 1972).

Fifthly, the Nine Saints played a crucial role in expanding the culture of monasticism in Ethiopia. According to Acts of the Saint (*Gedle*), the Nine Saints arrived in Aksum in 480 AD, during the reign of Ella Amidas IV (c. 475-486 AD) and remained there for 12 years (Christopher 2008). The monks fled their homeland as a result of the decision of the Council of Chalcedon (451) to enforce the notion of two separate natures of Christ, on the basis of Pope Leo I's statement of faith (Sergew 1972). In the subsequent years, those who disagreed with that decision (later known as

“Miaphysites”, or believers in one nature of the God Incarnate), were persecuted by the pro-Chalcedonian government in Constantinople. Since Egypt was the part of the Empire with the largest number of Miaphysites, many of them fled there. King Ella Amida requested the monks from Egypt to expand Christianity and to establish churches. Based on the request, the Nine Saints came to Aksum and the King warmly received them (Sergew 1972).

Lastly, the Royal family of Aksum facilitated the expansion of mummification as a means of cultural solidarity with the Romans and Egyptians. King Ezana’s conversion to Christianity was partly due to the influence of his mentor and partly his desire to solidify a trade partnership with the Roman Empire (Sergew 1972). Justin (518-527 AD), a Byzantine Emperor, encouraged King Kaleb to expand the territory of Aksum to south Arabia and later requested military intervention against Dhu Nuwas (517-525 AD). Nuwas, who was the leader of the Ḥimyarite Kingdom, prosecuted Roman Christians and attacked the Aksumite garrison (Sergew 1972). Kaleb led the punitive expedition in 525 AD in which he ambushed Dhu Nuwas and asserted Aksumite dominance of the Red Sea trade route (Sergew 1972). Consequently, Kaleb was able to maintain strong trade relations with the Romans and resisted Justinian attempts to impose Chalcedonian Orthodoxy upon Aksum (Christopher 2008, p.123). The Romans also conducted mummification and might have introduced this tradition of to Ethiopia. King Ezana favored and offered trade benefits for the Roman merchants who spread Christianity throughout the kingdom (Sergew 1972). The introduction of Christianity and the expansion of mummification by the Roman merchants were possibly instrumental in

unifying the kingdom. The civilization of Aksumite reached its zenith during the reign of Kaleb in the sixth century, where Coptic Egyptians practiced mummification at this time.

### **Historical sources**

Historical documents – such as royal chronicles, letters and church monographs, which are mainly preserved by the EOC – are other important sources. These documents were also susceptible to subjectivity and often tended to include the glory of the kings rather than the actual historical event. Nevertheless, historical sources critically examined provide valuable insight.

The historical sources of the Queen Sheba are from the Bible and Kibre-Negest. The earliest source for the Queen Sheba at the beginnings of the first millennium BC is from the Bible (1 Kings 10:1-3 and 2 Chronicles 9:1-12). Nevertheless, extensive elaboration has been made in the Ethiopian, South Arabian and Jewish literary traditions (Mikre-Sellassie 2000). Kibre-Negest is the other historical source that describes the Queen Sheba and further elaborates the succession of the Ethiopian kings. As indicated earlier, King Menelik I was the bloodline to the Ethiopian royal dynasty. The tradition continued, except briefly interrupted during the Zagwe Dynasty, during 12th and 13th centuries and all the way to Emperor Haile Sellassie I (1930-1974), where the Emperor included it in Article 2 of the Revised Constitution of Ethiopia 1955: “The Imperial dignity shall remain perpetually attached to the line descends . . . . without interruption from the dynasty of Menelik I, son of the Queen of Ethiopia, the Queen of Sheba and King Solomon of Jerusalem”, demonstrating the role of oral tradition.

The work of Herodotus was another historical source about the practice of mummification in Ethiopia. Houston (2007, p. 80) cited Herodotus and wrote: “the skill of

the Ethiopians in embalming was superior to the methods of Egypt. The Ethiopian mummy could be seen all the way around that they were preserved in columns of transparent glass.” He also further elaborated that ancient Egyptians used to import the sharp obsidian stones, timbers, fragrances and adhesive substances from ‘Ethiopia’ used in the process of mummification (Chapter 2). Before the adoption of embalming, the Ethiopians “buried their dead with their legs doubled up against the abdomen and thorax” (Houston 2007, p. 70). Based on this account, the practice of mummification was known in Abyssinia. Knight (1836) cited Herodotus and elaborates the location of ‘Ethiopia’ as perhaps being situated in Abyssinia, Nubia and Sennaar. Further archaeological and historical research is needed to prove or disprove Knight’s explanation.

Another historical document that provides clues about the tradition mummification is the *Fetha Nagast* (the Law of Kings). It is a law that governed the church and state during medieval Ethiopia and elaborates the whole process of accession of the king, appointment and conscription of patriarchs, bishops, priests and deacons. For example, the exclusion of Ethiopian elite bishops was stated in *Fetha Nagast* as:

As for the Ethiopians, a patriarch shall not be appointed from among their learned men, nor can they appoint one by their own will. Their metropolitan is subject to the holder of the see of Alexandria, who is entitled to appoint over them a chief who hails from his region and is under his jurisdiction (Strauss 2009, p. 17).

As a result, the EOC was under the hegemony of the Coptic Church of Egypt from 340-1959 AD (Sergew 1972).

The *Fetha-Nagast* also describes the embalming processes, noting that treating a dead body is a customary practice done by the Disciples of Jesus . . . if [embalming]

were a wrong thing, the faithful would not have done it in the time of the Disciples and . . . they did not forbid them to do so.” (Strauss 2009, p. 122). The *Fetha-Nagast* further elaborates that a dead body must be cleaned thoroughly, furnished with oil and incense. It also clarifies that the body must be wrapped and “shall be placed in an honored place near the pure bodies of those who were his equals in rank” (Strauss 2009, p. 123). It reflects the social status of the priests.

### **Archaeological Source**

Archaeological sources related to the practice of mummification in Ethiopia are inadequate. Mummified human remains were seldom preserved in the open-air sites, mainly due to various factors such as animal, biological, environmental and human deteriorating factors. Archeologists recovered only few fragments of skeletal remains. Human skeletal evidence was recovered from the pre-Aksumite and Aksumite periods (D’Andrea et al. 2011; Fattovich and Bard 2001; Finneran 2009; Phillipson 2009; Phillipson et al. 1995). However, mummies in caves are rarely researched, as more emphasis is focused on church painting, architectural style and construction of cave.

### **Christianity in Ethiopia and Eritrea**

As indicated earlier, mummification might have been practiced before the introduction of Christianity in Ethiopia. Although Christianity was introduced to the Aksumite Kingdom in the fourth century AD, the religion had been practiced in Ethiopia since a much earlier time (Sergew 1972).

The long-standing trade and religious relationships with Romans, Greeks and Armenians also facilitated the expansion of mummification and the transfer of architectural knowledge leading to the construction of cave churches in Ethiopia

(Sergew 1972). The coming of the Nine Saints in the fifth century was instrumental in the expansion of Christianity, monasticism and mummification in the kingdom of Aksum.

### **The Nine Saints and Expansion of Mummification**

The Nine Saints possibly expanded the practice of mummification. Christianity had been expanded and consolidated (c. 350-650 AD) mainly due to the efforts of the Nine Saints and the support of the Aksumite kings. The kings presided over the EOC and the Kingdom (Sergew 1972). The Bishop Minas, who was the first Egyptian, succeeded Frumentius, where the tradition of consecrating of Egyptian Coptic bishops, which lasted for sixteen hundred years, may have played a role in the expansion of the mummification practice in Ethiopia. From 340 to 1959 AD, Ethiopian priests were precluded from being consecrated as bishops (Sergew 1972). In retrospect, the Nine Saints contributed immensely to the expansion and consolidation of Christianity in Aksum (Sergew 1972). There were also other saints who contributed to the construction of ancient monasteries in present day Eritrea, formerly part of the Aksumite kingdom of Ethiopia. The most venerated saint in the country was Abba Libanos, who constructed the famous monastery of Abba Libanos.

The Saints also contributed to the advancement of the *Ge'ez* liturgy and literature particularly through the translation of the Bible into *Ge'ez*. The introduction of Christianity was accompanied by the introduction of monasticism. It also contributed to the development of literature, royal conversion and amalgamation with the ecclesiastical hierarchy, and was used as a tool by the monarchy to promote centralization and create Christian civilization in Ethiopia.

## **The Development of Cave Monasteries and Monasticism in Ethiopia and Eritrea**

As explained above, the tradition of monasticism was introduced into Ethiopia with the introduction of Christianity. Thus, Christianity consolidated the tradition of monasticism, particularly with the arrival of the Nine Saints, who played a crucial role in expanding the culture of monasticism and mummification in Ethiopia. The pattern of monastic life was divided into communal and private parts. In communal monastic life, possession of private property was prohibited, while in private monastic life, ownership of assets was permitted.

The Nine Saints founded several monasteries (Table 3-1). Abba Pantelewon and Liqanos were advisors to the royal family of Aksum and built monasteries near the royal court. The rest resided on hilltops and near prominent crossroads along the Aksum-Adulis corridor, which were formerly pagan sites (Christopher 2008). The pagan sites were mostly destroyed and converted to Christianity. For example, the pagan temple of Yeha, a Sabaeen pagan sanctuary, was used as the foundation for one of the oldest Christian churches in Ethiopia. Abune Aregawi, the most respected of the Nine Saints, constructed the famous monastery of Debre Damo on the hilltop, only accessible by a tainted leather rope let down a 55-foot cliff side (Figure 3-1). In addition to the dedication of the Nine Saints, the support of Aksumite kings was instrumental in the widespread conversion of Aksumite to Christianity. The evangelization crusade of the Nine Saints coincided with the height of the Aksumite kingdom.

### **Mummification Tradition in Eritrea**

The origin of mummification in Eritrea is also nebulous. The traditional sources regarding the practice of mummification are “controversial and sometimes paradoxical”

(Yihak 2012). According to oral tradition, the Nine Saints, who came at various times between the fifth and eighth centuries to expand Christianity, may have introduced the practice of mummification to Eritrea.

Cave monasteries in Eritrea served as a burial ground for Orthodox followers. It is common to observe mummified bodies in the cave monasteries. For example, Abba Twelde-Berhan, a local priest, exhumed 60 mummies (Figure 3-2), sandals and several tools from the Abba Libanos monastery (Anfray 1994, p. 7; Carillet et al. 2009, p. 340). Yihak (2012) provides insightful information regarding mummies of the Abba Libanos cave monastery. The mummified bodies were wrapped with cotton cloth and then re-wrapped with animal skin and tightly tethered with leather cords. Based on the local tradition, Yihak (2012) reported that the Abba Libanos was mummified and may have possibly been among the mummified human remains found in Abba Libanos cave monastery (Yihak 2012, p. 2). The mummies were exceptionally well-preserved. According to local oral tradition, they were possibly mummified during the fifth and sixth centuries (Yihak 2012). However, there was no carbon-dating evidence that confirms the oral tradition.

### **Mummification Practices in Ethiopia**

Natural mummification may also have played a crucial role in the origin of the tradition. Most of the monasteries also buried their dead inside the cave church, which provides an excellent environment for the preservation of the mummies. Evidently, numerous corpses were found in well-known monasteries in north and central Ethiopia. Thousands of mummies were uncovered in various monasteries in northern, western, central and southern Ethiopia. No scholarly or oral-tradition information revealed knowledge of the presence of mummies in eastern Ethiopia. Mummification was less

likely practiced in the past in eastern Ethiopia as the region was predominantly occupied by pastoralist societies. Societies such as Afar, Somali, Karayu and others in the region were culturally different from those in northern and central Ethiopia.

### **Mummies in North and Central Ethiopia**

**Mummies in northern Ethiopia.** Northern Ethiopia is a place where several monasteries and cave churches were built. Moreover, the natural environment also played a pivotal role in the preservation of mummies. Some of the monasteries include the Debre Damo, YK, Lalibela and Genete Mariam (Table 3-2). The Lalibela rock-hewn churches contain numerous catacombs for devout monks and pilgrims (Figure 3-3 & Figure 3-4). However, during the survey of Lalibela, most of the crypts were empty except the Church of Bête Giyorigis. According to Deacon Sewmehon, mummies of unknown individuals were stacked inside a catacomb and reburied. Access to these mummies was restricted (Figure 3-5).

Northwestern Ethiopia is also the home for the mummies of numerous Ethiopian kings. Lake Tana monasteries serve as depositories of mummified kings of the Solomonic Dynasty (1270 to 1974). Bantalem (2004) states that some of the monasteries contained mummified bodies of Ethiopian kings. For example, the bodies of medieval Ethiopian kings such as Yekuno Amlak (1270-1285), Dawit (1380-1430), Zadengle (1603-1604), Fasildase (1636-1659) and Bakaffa (1721-1730) were mummified and displayed in glass coffins in Dega Estefanos Church in Lake Tana (Bantalem 2004).

**Mummies in central Ethiopia.** Anfray (1985) reported the presence of mummified remains in numerous caves in Shewa such as the AM, DS and Tseha

Michael (Chapters 5 and 6). Similar mummification practices were also found in the Lake Ziway, in south-central Ethiopia.

### **Mummification in Southern Ethiopia: The Konso People**

The Konso people have performed mummification for kings and clan leaders since the 16<sup>th</sup> century. It is a common tradition of venerating ancestral spirits. Formerly, the process of mummifying the king's body used to take a prolonged period depending on the quantity and quality of the harvest. For instance, Chief Kayote Kalla's body was maintained and treated for nine years in the 1980s and 1990s (Figure 3-6). It was continuously treated with white onions, beeswax, butter, honey, frankincense and other materials. However, because of an extended period of drought and the high cost of preservation materials, his son Kala Wolde Dawit's body was treated for only nine months, with each month representing a year (ARCCH 2009),

The burial process is associated with various stages of rituals whereby, when the dead ritual leader is followed to his grave, the new is initiated (ARCCH 2009, p. 38).

The Konso people are also traditional grave markers, using wooden-statue (Waka) and erected-stone (Daga-diruma) burial indicators. The Waka, an anthropomorphic wooden statue, carved out of juniper mimicking the deceased, is erected as a grave marker. For example, the ritual chief Kala Wolde-Dawit's grave was marked with this type of wooden statue (Figure 3-7). The statue has a clearly marked head, eyes, ears, mouth and genital organs. However, the Waka is also engraved and erected for the living chief priest, called the Bamale and his living wife (Figure 3-8).

## Summary

The origin of mummification in Ethiopia – based on various oral traditions, historical and archaeological sources – is attributed to three different views, specifically: the north-south hypothesis, the south-north hypothesis and the independent hypothesis. First, the north-south hypothesis posits that the origin of mummification radiated from the north to the south. Ancient Egyptians prolonged religious, commercial and political contacts facilitating the way for the extension of the mummification practice into the Nubia and further south to Ethiopia. Similarly, in Ethiopia, the practice of mummification started in the north and extended to the southern Ethiopia. This hypothesis aligns with the border view that civilization flourished in the north and then expanded into the south. Secondly, the south-north hypothesis, contrary to the first view, states that mummification started in the south and extended to the north. It aligns with the origin of humankind where humans originated from the south and radiated to the rest of the world. Lastly, the independent hypothesis forwards the idea that the practice of mummification began independently in different parts of the country.

The introduction of Christianity, the development of monasticism and the practice of mummification were closely interrelated in Ethiopia. Sergew (1972) argues that Christianity retained some aspects/elements of paganism and Judaism in Ethiopia mainly due to the prolonged commercial contacts with Biblical Israel, Egypt, South Arabia, Greece and the Roman Empire. Nonetheless, Abune Selama introduced Christianity in the 4<sup>th</sup> century during the reign of King Ezana. Christianity had been expanded and consolidated during Aksumite civilization mainly due to the efforts of the Nine Saints and the support of the Aksumite kings, who may have played a role in the expansion of mummification in Ethiopia and Eritrea.

Cave churches and the carving of monasteries were introduced during the Aksumite civilization and later flourished during the Zagwe Dynasty, particularly throughout the reigns of the YK and Lalibela (Mengistu 2004). Diverse views have been expressed regarding the architectural styles. Monasteries are places of peace and power, where mummification is a practice of preserving memories of deceased individuals to shape the social-cultural, political and religious landscape of medieval Ethiopian societies.

Table 3-1 The names of the saints, place of origin and the monasteries they founded in different part of the Aksumite Kingdom. Source Ethiopian Orthodox Church.

Saints Name	Place of Origin	Founded monastery	Description of monastery location
Abba Liqanos	Constantinople	Debra Quanasel	East of Aksum, beyond the plateau of May Qoho.
Abba Pantelewon	Constantinople	Abba Pantelewon Madara	Near Aksum on the pagan temple of Mahrem, in Tigray Region
Abba Gerima	Constantinople	Adwa /Abba Gerima	5 kilometers east of Adwa in Tigray Region
Abba Guba	Cilicia	Endabaguba	Adwa in Tigray Region
Abba Zemika'el Aregawi	Constantinople	Debre Damo	Between Adwa and Addigrate in Tigray Region Built near Adwa and the served as a tower of the Aksumite period, Tigray
Abba Afese	Asia Minor	Yeha,	
Abba Tsehma	Antioch	Sedenya	Tigray Region
Abba Matewos	Syria	Debre Libanos	Eritrea Ham

Table 3-2 Distribution of mummies in Bugna and Last Woreda of Northern Wello and Mida Woremo of Northern Shewa. Source: Mida Woremo and Lasta Woreda Cultural and Tourism Bureau. Mengistu 2004 and Anfray 1985

Type of cave monasteries in and Wello	Number of Cave monasteries with mummies	
	Northern Wello	Northern Shewa
Built-up cave	5	5
Semi Monolithic	13	3
Monolithic	3	1



Figure 3-1. The Debre Damo monastery, the height is 25 meters and only men access it. The monastery also host several mummified human remains. Photo credit: Tigray Cultural and Tourism Bureau 2015



Figure 3-2. Mummies discovered from the Dabre Libanos monastery in Ham, Eritrea. The mummies belonged to diverse social status. The most visible three mummies from right to left show a Follower (placed hand on the genital), the middle was a priest (hand crisscrossed over the chest) and the last was a monk as the head tilted down and hand placed on the ear. Photo Credit: Yihak 2012



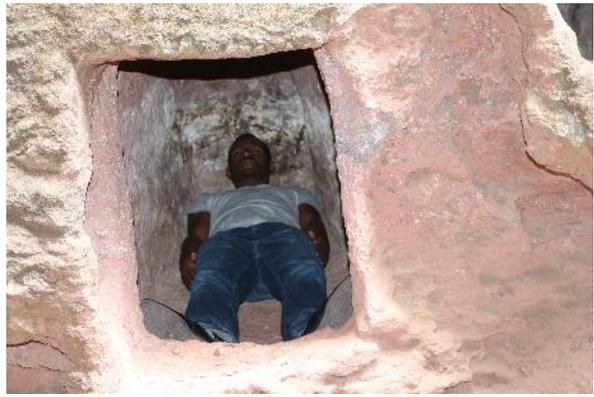
Figure 3-3. The Beter Giyorigis rock-hewn church, World Heritage site, and shows representative catacombs and hosted the last mummified human remains. The cranial and upper postcranial parts of mummies were significantly damaged. Photo credit: Abiyot 2013



A



B



C

Figure 3-4. Catacomb in Lalibela rock-hewn Church. A) It was used as prayer and burial place for religious and church officials. All mummies in these and other catacombs were removed and reburied, except one. B) Unidentified and unknown mummified human remains in Bete Giyorigis. C) The relative size of the catacomb is about 2.5 by 1.5 meters. Photo credit: Abiyot 2013



Figure 3-5. Tourists visiting the site of YK during fieldwork. Photo credit: Abiyot 2013



Figure 3-6. Kala Kayote's mummified body presented to mourners just before his burial (eight years after his death) in the Kala forest (photo taken from the photo framed by Kala Gezehegn). Photo credit: Abiyot 2008



Figure 3-7. Wooden anthropomorphic statue erected in 2002 for the Waka of Kala Wolde-Dawit who was the ritual chief or Poquola of Gamole, Gocha and Mechelo paletas. Photo credit: Abiyot 2015



Figure 3-8. Anthropomorphic statues depicting the living ritual chief priest called the Bamale and his wife. The zoomorphic wooden statue of la eopard in front of them is meant to show Bamale's bravery. Photo credit: Abiyot 2015

## CHAPTER 4 ARCHAEOLOGICAL RESEARCH ON CAVE CHURCHES AND MUMMIES IN NORTHERN AND CENTRAL ETHIOPIA

Chapter 4 focuses upon geoarchaeological, physiographic and built-up and rock-hewn church in north-central Ethiopia. The geoarchaeological setting of northern and central Ethiopia are briefly summarized to contextualize cave formation and layout the regional climatic condition, which is crucial for the preservation of mummies. A physiographic setting of the region is also explained to provide background information regarding location, topography and present demography of the study area. The archaeological survey in the surrounding sites coupled with the study site map (Figure 4-1) was explained to provide baseline data for this dissertation and other studies.

### **Bioarchaeological and Geoarchaeological Studies**

Ethiopia is endowed with numerous natural and artificial caves, where thousands of extremely well-preserved mummies are found. However, there is no bioarchaeological work on the mummies/mummification practices particularly from northern-central Ethiopia. Human skeletal evidences were recovered from pre Aksumite and Aksumite period (D'Andrea et al. 2011; Fattovich and Bard 2001; Finneran 2009; Phillipson 2009; Phillipson et al. 1995). These human skeletal bones were barely preserved. Thus, there is no evidence of mummified human remains recovered from pre-Aksumite and Aksumite archaeological site. However, after the 4<sup>th</sup> century there is some archaeological evidence of mummies in northern and central Ethiopia. G. Mengistu, who conducted extensive work on the YK site, affirms the presence of numerous mummies in the YK. He calls for further geoarchaeological and bioarchaeological investigation to further understand the cave environment, to identify the contribution of soil in the preservation of mummies, the biogeography of the

mummified human remains in the YK cave monastery and the historical archaeology of the Zagwe Dynasty. These kinds of study require multidisciplinary research that cuts across the various field of study. Similarly, Butzer (2008) also stresses the need for multidisciplinary research such as geoarchaeology to reconstruct past ways of life. According to Butzer (2008, p. 402), geoarchaeology is a new field of cross-disciplinary research aimed at reconstruct past ways of life using geological, environmental and archaeological data. Butzer further explains that researchers must understand the challenge of extracting data using cross-disciplinary subjects (e.g., mummified remains). For example, archaeologists preferred cave sites, as they were believed to be “complete and undisturbed archaeostratigraphic sequences” (Butzer 2008, p. 402). By the same token, most of mummies in the YK, AM and DS were disturbed and found in their secondary deposition where most of the contextual archaeological data were lost forever. However, the nature of deposition, physical, chemical and biogenic factors could alter the archaeological or bioarchaeological remains. Therefore, understanding the geological, environmental, biological and cultural factors are crucial to overcoming them, and interpreting the data. Thus, mummies in these sites provided extensive bioarchaeological and osteological information.

These caves have attracted geoarchaeological research in northern and central Ethiopia (Abbate et al. 2015; Asfaw 2002; Billi 2015; Butzer 2008; Ciampalini 2012; D'Andrea et al. 2008; Darbyshire et al. 2003; Fattovich 2010; Finneran 2009; Mengistu 2015, 2004; Nyssen 2004; Oba 2014; Phillipson 2009; Rezulli et al. 2011).

Numerous geological studies were conducted to understand the geoarchaeology of northern and central Ethiopia, particularly cave formation (Abbate et al. 2015; Asfaw

2002; Billi 2015; Butzer 2008; Ciampalini 2012; D'Andrea et al. 2008; Darbyshire et al. 2003; Fattovich 2010; Finneran 2009; Nyssen 2004; Oba 2014; Phillipson 2009; Rezulli et al. 2011). Most of the caves in the northern Ethiopian plateau are composed of volcanic basalt and the rhyolites formed between the Oligocene and the Miocene (Rezulli et al. 2011). Asrat and Ayallew (2011) and Billi (2015:5) identified the presence of tholeiitic lava, basalts rock, rhyolitic-trachytic lavas and pyroclastic rocks in central and northern Ethiopian highlands and suggested these rock types are convenient for the cave formation. The most common type of rock found in the study sites includes scoriaceous basalts, breccias, and rhyolites ignimbrites. For example, Yemirehane Christos church is constructed in a natural basaltic cave (Mengistu 2004).

Asfaw (2012) suggests that rock type is a major factor in the selection and carving of caves in Ethiopia. He concludes that builders of the rock-hewn caves had knowledge about the rock types. In early monastic life, priests, monks, and nuns intentionally selected natural caves to prepare catacombs both for living and later for burial. Sometimes, they tended to hack a single solid rock to make monolithic and semi-monolithic cavers (Chapter 3).

Geologic formation is also important for the creation of the soil type in the cave that facilitated a way for the preservation of mummies. For example in the AM cave monastery, there was a mummy where the cranial and substantial postcranial body parts are preserved but the leg of the mummy was decayed. The local people and living priests state that it is God's miracle and testimony that Abune Melke Tsadik, who is buried in the church, will not decay. Coincidentally, the decayed part is outside of the church boundary. Dr. Derese, a researcher from Debre Berehan University,

hypothesized three possible reasons: the tradition of mummification, chemical composition, and environmental factor for either preservation or decomposition of the mummy. According to Dr. Derese's hypothesis, the mummies were preserved due to a unique burial traditional practice, where a deceased individual was buried on his head first (upside down). However, the hypothesis was not based on archaeological or historical findings.

Understanding of the cave environment is important for the preservation of the mummies. Although various scholars most have attempted to reconstruct the environmental history of northern Ethiopia, most of them focused in Pre-Aksumite and Aksumite areas (Bard et al. 2000; Brandt and Nanny 1987; D'Andrea et al. 2008; Darbyshire et al. 2003; Fattovich 2010; Nyssen 2004; Oba 2014; Phillipson 2009). Bard and her colleagues concluded that the climate and vegetation of the region changed over time. This change over time was summarized in the seven points below

(1) the plateau experienced a more humid climate with a denser vegetation cover during the Early Holocene; (2) Soil erosion due to clearing vegetation began in the Middle Holocene; (3) agricultural activity was intensified in the Late Holocene, as a consequence of the rise of a state; (4) demographic pressure increased from the early first millennium BC to the mid-first millennium AD, causing soil erosion; (5) environmental degradation and demographic decline occurred in the late first millennium AD; (6) the vegetation cover was regenerated in the early second millennium AD; and (7) progressive vegetation clearance started again in the second half of the second millennium AD (Bard et al. 2000, p. 65).

Bard explained that the gradual environmental change over a long period in the region resulted in drought and a multitude of socioeconomic crises. Consequently, the environmental challenge was a factor in the decline of Aksumite civilization and Zagwe Dynasty. Although the climatic factor was responsible for the collapse of the civilization,

it also provided an excellent condition for the preservation of mummies in the cave sites in northern and central Ethiopia.

Understanding the climate and vegetation within the study area helps to answer questions about the type of preservation. According to the National Meteorology Agency (NMA) of Ethiopia, the study region is divided into five climatic zones namely: very cold, cold, cool, moderately warm and warm (NMA 2016). The AM and DS study sites belong to the moderately warm climatic zone, but the YK very belongs to cold climatic zone. One of the fundamental factors for the preservation of the mummies is the climatic condition. The environment in the caves oscillates from season to season. However, the alternate variation warm and cold during day and night respectively facilitated the preservation of mummies.

### **Physiography of Northern Wello and Shewa Zones**

The geographical location of Northern Wello and Northern Shewa is within the Amhara Region in Ethiopia (Figure 4-1). In Northern Wello, Mount Abune Yosef, 4260 meters above sea level (MSL), is the highest mountain in the Lasta massive of the Northeastern Ethiopian highlands. The highest concentration of cave churches is found in the Lasta massive, namely: the YK, Genete Mariam, Emakina Medhane Alem, Lidetta Mariam, Zammadu Mariam, Nactu La'ab and Lalibela rock-hewn churches. All of these monasteries contain mummified human remains. However, the remains are poorly protected from imminent destruction. Only in Genete Mariam, where a mummy was placed inside coffins sealed with glass. The date of these mummies is unknown.

Further south in Northern Shewa, Mount Abuye Meda, (4012 meters above sea level) is the highest point in the western escarpment of the Great East African Rift Valley in Central Ethiopia. The rugged topography and valleys add serenity and beauty

to the region. The natural narrow land bridge found in Mida Woremo District played a pivotal role in connecting Central Ethiopia with northern Ethiopia (Figure 4-2). The AM and DS caves are found on the northern side of the land bridge. The rugged topography and valleys created by Blue Nile tributary, Jamma River, dissect Northern Shewa from Southern Wello.

Acquiring Northern Shewa and Northern Wello demographic data for a contemporary medieval period of the study is difficult due to the absence of official population census data. However, providing a brief overview of current demographic information of the zones could shade light on past population demography and cultural landscape. The population of Northern Shewa and Northern Wello is 2,131,857 and 1,733,616 respectively. More than 90% of zone's population belongs to Amhara ethnic group, speaks the Amharic language and practices Orthodox Christianity.

### **Previous research on the Development of Cave Churches in Ethiopia**

Ethiopia is a land where numerous cave churches and monasteries have been discovered (Asrat 2002, Mengistu 2004, Finneran 2013, Phillipson 2012); most are burial grounds and host several mummies. However, the genesis of cave churches and monasteries is unknown. Undoubtedly, however, some of the cave churches were built for the kings as their final resting places. For example, the burial tomb of the YK, AM and Lalibela were found in their respective cave monasteries. Yimrehane Kirstos' tomb is built like a tent on the right side of the church within a cave. Similarly, the tomb of King Lalibela is found in Bete Golgotha hewn from the rock as a cave (Chapter 4).

Francisco Alvarez documented the landscape and site preservation of the Lalibela and YK. However, due to site inaccessibility and reported the presence of

several thousand of mummies in the YK, few studies were conducted until the second half of the 20<sup>th</sup> century.

Research published on cave churches in Ethiopia since the 1960s barely mention thousands of mummies in the caves that were studied. The large volume of published studies describes the role of art history and architectural history of the prominent rock-hewn churches (Lepage 1997; Gervers 2003), iconography and liturgy (Fritsch 2008), geology (Asfaw 2002, 2009; Asfaw et al. 2012,) and archaeology (Phillipson 2009, Finneran 2012). The majority of the works was focused on Lalibela rock-hewn churches. Some scholars (Anfray, Phillipson, and Finneran) made reference to the mummified human remains staked in the cave. They were not thoroughly researched.

Francis Anfray undertook the earliest comprehensive survey and description of cave churches in Ethiopia from the 1960s to 1980s (Anfray 1985). He reported the distribution of cave churches found all over the country: stretching from Mariam Debre-Tsina near Keren in Northern Tigray, and west to Gojjam, to the east in Afar, to Abbo Washa near Goba in southern Ethiopia, and Washa-Mikael in Jimma in southwest Ethiopia. He reported the distribution of cave churches and the presence of mummies in northern, northwestern and central Ethiopian cave churches (Anfray 1985).

Asrat (2010), Finneran (2007 and 2009) and Mengistu (2004) state that a high concentration of cave churches is found in Tigray, Wollo and Shewa, of which the highest intensity is in Tigray (Asrat 2010; Finneran 2007 and 2009). However, the priority of this research was given to the rock churches origin and architectural style

than the mummies. As a result, the practice of mummification and mummies were largely excluded from the studies.

Mengistu (2004) presents a summary of indigenous (autonomous) or foreign views forwarded to explain the origin of rock churches in Ethiopia. Mengistu (2004, p. 58) argues that the role of the Saints were instrumental to the “origin of rock-cut ecclesiastical architecture in Ethiopia,” who inherited the heritage of monastic life from well-respected desert fathers in Egypt, Syria and Asia Minor.

The main reasons for constructing the cave churches were as burial graveyards, as symbolic expression and to develop the culture of asceticism. The construction of rock-hewn churches and the use of natural caves had a symbolic value as the builders attributed them to Christ’s birth and tomb places (Mengistu 2004). In the New Testament, Christ was buried in a rock tomb, as indicated in Mathew as follows:

Joseph had taken the body and wrapped it in a clean linen cloth and laid it in his own new tomb, which he had hewn out in the rock. (Math. 27, p. 59-60).

Caves have also symbolic associations with Old Testament prophets, with St. John the Baptist, and with the episode of Lazarus (John 11:38-41) where Jesus raises Lazarus from the dead. Jesus entered the cave to see the tomb and said “Take away the stone Lazarus, come out!” Lazarus came out but his body was wrapped with linen clothes.

Some scholars (Gerster 1970; Hancock 1997) argue that the architectural design of Ethiopian rock-hewn churches reflected the Eastern Orthodox cave churches of the Greeks, Romans, Armenians, Syrians or Egyptians. The prolonged socio-economic and religious ties are often provided as a cause for the adoption of the Classical or Oriental style. The construction of the rock-hewn churches in northern Ethiopia is partly

attributed to the influence of foreign architectural design and construction (Gerster 1970). The elegance, precision, durability and magnificent beauty of cave churches are beyond the capacity of the knowledge of native builders (Hancock 1997). Therefore, ancient and medieval Ethiopian kings imported experts or received welcomed voluntary experts from foreign countries to construct the rock-hewn churches.

In contrast to the view of foreign influence, some scholars (Ayalew 2003; Buxton 1947; Mengistu 2004) argue that rock churches in Ethiopia are indigenous. The architectural styles of the cave churches reflect the socio-cultural, political and religious life of Ethiopians. Indeed, the builders of the cave churches took ideas from the Bible and also visited Oriental Cave Churches. For instance, King Yemirehane Kristos, who built a cave church named after him, travelled to Jerusalem and Egypt. He had the first-hand knowledge of the cave churches in Golgotha and mummification.

Later, King Lalibela constructed the eleven rock-hewn churches in the Christian Highland Kingdom as recreations of those in Jerusalem. They became a world heritage site in 1978. These magnificently curved rock-hewn churches were constructed over a long period. The builder used very elementary tools to carve out and build the rock churches and catacombs where the mummified individuals were buried.

According to Buxton (1947) and Mengistu (2004), rock churches are broadly classified into three major types: Built-up Caves, Semi-monolithic Rock-hewn, and Monolithic Rock-hewn. Additionally, Anfray classified the rock churches into six categories. For the sake of this dissertation, it is sufficient to classify them into Built-up Cave churches and Monolithic Rock-hewn churches. Mummified human remains have been discovered in both. The first types of churches were ordinary buildings constructed

inside a cave to minimize the impact of natural and human intervention. The majority of rock churches belong to the built-up cave type. The YK, AM and DS monasteries included in this study, are Built-up Cave churches.

Rock-hewn churches are further classified into two types: monolithic and semi-monolithic. The former are carved out of a single solid rock from top to bottom. The basement is the only attachment to the solid rock. The most well-known monolithic churches include Bete Mariam, Bete Medhane-Alem, Bete Amanuel, Bete Giorgis, Genete Mariam and Kenkenit Mikael. These churches are depositories of mummies. In each church, catacombs were built to serve as a burial ground for higher-status members of the clergy.

Semi-monolithic rock-hewn churches are found more frequently than monolithic cave churches. Although the church is hacked from single solid rock, part of it is not completely separated from the solid rock. The degree of attachment may vary in thickness/size and angle, hence, called semi-monolithic churches. Many of the Lasta Wereda rock-hewn belongs to this type. Semi-monolithic cave churches include Arbatu Ensesa, Bilbala Giyorgis, Asheten Mariam, Sarzina Mikael and some of the Lalibela rock-hewn churches.

Most of the archaeological and historical research in north and central Ethiopia at best mentioned the presence of mummified human remains and provided little description about the general situation of the mummies; at worst mentioned nothing about even the existence of mummies in the caves. Phillipson (2004) called for further research and a new methodological approach to studying the post-Aksumite era.

The extraordinary preservation and the long history embedded within the material culture provide invaluable insight into the little-known part of medieval Ethiopian history. Data about post-Aksumite archaeology remains were scarce. Most of the archaeological and biological research focused on or before Holocene period. Even the archaeological and environmental research conducted during this period concentrated on the Pre-Aksumite and Aksumite periods (Finneran 2012, 2009). As a result, the post Aksumite period was given little attention in reconstructing the historical archaeology of medieval Ethiopia.

David Phillipson (2004) invokes the methodological challenge for the paucity of post-Aksumite archaeological knowledge in northern Ethiopia. He explained that, for instance, the style, technique, engineering and religious practices in medieval cave churches are the continuities of Aksumite civilization. The socio-cultural and religious aspects of the two dynasties demonstrate more continuity than discontinuity. The civilization of medieval Ethiopia is inseparable from its predecessors. As a result, post-Aksumite historical archaeology has been lumped to the Aksumite period.

However, recently there has been a shift of focus to study the post-Aksumite period. It is important to note that all the archaeological work done in these periods provided immense knowledge about the past way of human life and are a foundation for future archaeological endeavors. Some of the major studies done in Lalibela and the surrounding region mainly focused on the rock-hewn churches (Finneran, 2009). In recent years, researchers have struggled with reconstructing the history of medieval Christian highland Ethiopia. It is becoming increasingly difficult to ignore the post-Aksumite period.

## **Archaeological Survey and Study Sites Mapping**

In 2012 and 2013, archaeological surveys have been conducted in central and northern Ethiopia (Chapter 5). The survey carried out in northern Ethiopia includes the YK, Lalibela and the surrounding areas. Additional archaeological surveys were carried out in central Ethiopia to include the AM, DS and Tseha Michael Cave Monasteries, and Kara Meshige Fort. These monasteries are home to hundreds of mummified human remains. The date and social status of these mummified individuals were unknown. However, according to oral tradition, they were mummified and entered into the monasteries between the 13<sup>th</sup> and 16<sup>th</sup> centuries AD. The archaeological excavation of the YK caves church is explained below.

### **Tseha Michael Cave Monastery**

Tseha Michael is the most inaccessible site, located east of the AM cave monastery. The local people used a narrow gorge to access the site and the surrounding areas. Although people traveled through the open narrow tunnel, there is a potential threat from avalanche of pebble rocks that might be triggered either by natural or artificial factors (Figure 4-3). The site was briefly surveyed in the summer of 2013. There were hundreds of mummified remains in the cave, but these were mostly broken and commingled.

This cave is the longest and deepest, where during the survey, I observed several granaries, deposited charcoal, fossilized logs, thick aeolian deposits (Figure 4-3). Dr. Brehane Asfaw led ARCCH research group to the site and reported the presence of fossilized woods, modern granaries and mummies in the Tseha Michael cave monastery (ARCCH Field report 1989).

## **Kara Meshige Fort**

The foundation of both churches goes back the medieval Christian Highland Kingdom of Ethiopia. Most of the churches and monasteries in medieval Ethiopia used inaccessible caves to reduce the danger of war. Numerous cave churches in Semen Shewa were constant targets of war. Material culture evidence of war still exists in Semen Shewa. Kara Meshige fort is 4000 meters length and 3 meters height (Figure 4-4a). It is constructed along the narrow land bridge that connects Southern Wello with Northern Shewa. This fort is material evidence regarding the wars fought for centuries

According to the oral tradition, Kara Meshige garrison was constructed during the reign of Judith (Yodit), the Beta Israel queen, who was the one of the adversary of ancient Aksum. The oral tradition further states that the fort was constructed with countless numbers of human fingers. However, the reason was unknown. It was constructed along the narrow land strip that divides the Northern Shewa from Southern Wello (Figure 4-4b). It was the battleground of four major Ethiopian wars namely: Yoddit Guddit, Christian Highland and Muslim Lowland (Ahmed Garagn), Ethio-Italian, and Derg-Woyane.

## **The YK Cave Monastery**

The YK is located in Lasta Wereda of Semen Wello of Amhara Region in Ethiopia. The site is approximately 717km north of Addis Ababa, the capital of Ethiopia and 42km northwest of the Lalibela rock-hewn church. The altitude of the church is about 2681 meters above sea level at the foothill of Abune Yoseph Mountain, which is 4190 masl.

The YK monastery protected an estimated 60 hectares of forest area. The Google Earth Satellite map shows designated forest and degraded landscape

surrounding the area. Some of the endemic forests include Koshela (*Acanthus sennii*), Kushelie (*Echinops ellenbeckii*), Ashenda (*Kniphofia foliosa*), Jebra (*Lobelia rhynchopetalum*) and Chirera (*Euryops pinifolius*) (Figure 4-5). The protected church forest was justified primarily for religious reasons. Followers internalize oral traditions and different psalms of Bible quotations and abide by the monastery or church rules where everything inside and surrounding a church/monastery is regarded as sacred. Therefore, forests in and around their premises have been preserved for generations. According to the local information, materials used for the preservation of mummies were extracted from the forest (Chapter 7). Mengistu refutes the idea that the construction materials for the YK Church were from Egypt and Jerusalem. He believed that the wooden materials were from the local forest and the stones were from nearby quarries sites in the Tekeze River. Hence, there was a close resemblance with the Tekeze sandstone (Mengistu 2004).

The YK is a built-up cave church constructed in the 11th century during the Zagwe Dynasty. Church monographs indicated that the church was constructed during the reign of the DS between 1087-1127 AD (Mengistu 2015). It epitomizes the Aksumite civilization because the church was built of the Aksumite wood and stone construction style (Figure 4-7). The projections and indentations, characteristic of the Aksumite architectural style, are reflected the internal division (Mengistu 2004). The external wall is plastered with wood and stone alternatively (Mengistu 2004, for further explanation of the internal elaborated woods and murals).

The YK church reflects the architectural style of the Aksumite period. It was constructed using timber woods and white plastered stones, alternatively. The wall is

divided by projections and indentations to perpetuate Aksumite architecture (Mengistu 2004). The king's palace, built at the same time as the church, was used as the treasure house where the Church's precious materials were stored. The monastery was an active religious site continuously used for a spiritual purpose.

Thousands of mummified bodies of priests and other unidentified individuals were found in the YK. Most of the mummified human remains were skeletonized and commingled (Figure 4-8). The mummies were relocated from their original burial places to expand the cave church. Most of the mummies were commingled and stacked at the back of the cave.

I prepared an archaeological site map for the YK cave monastery site. An unimpressive wall protects exterior part of the cave monastery. Measurement of the total cave area and the relative distance of each feature in the cave are measured and collected data is entered into AutoCAD to prepare a site map. The major historical features in the cave monastery include the church, treasure or former Palace, the tomb of the emperor, and the human remains including mummies and skulls (Figure 4-9).

### **The AM Cave Monastery**

The AM is a built-up cave monastery, about 245km north of Addis Ababa, in Central Ethiopian (Figure 4-11). Hundreds of mummified human remain have been uncovered from the AM cave monastery. The site is selected for the study particularly because of the presence of extremely well preserved mummified remains (Figure 4-12).

Most of the mummified remains have been removed from their original burial ground and stacked in a secondary deposition area located deep inside the back of the cave church, mainly as a result of the renovation. Several mummies were found in erect/standing positions while others lay on the floor and in burial cases within the

church. The mummified remains are stored in a corrugated room. Local people used to take pieces of body parts of the mummy or wrapping materials to receive the Holy Spirit of the mummies; an act resembling the receiving of the Holy Communion, which is a tradition inculcated to Christianity from traditional pagan religion. Some people place the pieces on their neck to combat evil spirits and also believe that pieces of the flesh would cure them of any disease.

I prepared archaeological site map for the AM cave monastery site. The map shows the main features such as the church service area, mummy storage area, main church, museum rooms and residential area (Figure 4-13).

### **DS Cave Monastery**

The DS is found near the town of Meragna (Figure 4-14), and west of the AM. According to Abba Esayas Alemu, it was founded in the 14th century, and regarded as one of the oldest churches in the area, next AM. According to the oral tradition, Abba Bereded, the founder of the church, came to the area from Gojjam to expand Orthodox Christianity, and looked for a cave with a pillar column inside, a clue imparted by God in his dream. Abba Bereded searched for such cave between the present day Gojjam and Northern Shewa until he found it in Meragna and named the cave as DS. According to the oral tradition, which is similar that of the AM monastery, God promised Abba Bereded to preserve whoever was buried within the church boundary. Accordingly, most of the corpses buried at the site were found in an excellent state of preservation.

The DS cave church offered a unique opportunity to acquire contextual data from the excavation of graveyards due to the renovation of the cave church, which would have been impossible otherwise. The religious authorities obtained permission from local communities to remove the cemetery for the newly-constructed church. The

prearranged permit provided an excellent opportunity to participate in the process of unearthing burial remains in the cave. Most of the remains were unknown to the local communities, as the mummies were from a different developmental period (Figure 4-16). It shows the cultural continuity of practices of mummification.

The monastery of DS was selected, as explained below in the methodology section, particularly due to the unique opportunity to understand the burial practice of Orthodox Christianity and to understand roles of priests in medieval Ethiopian society. The local communities were consulted and participated in the renovation process of the church since 2010. An archaeological site map that shows the area of excavation, church and mummies location was plotted (Figure 4-16).

### **Summary**

Ethiopia is endowed with numerous natural and artificial caves, where thousands of extremely well-preserved mummies are found. However, there is no bioarchaeological work on the mummies/mummification practices particularly from northern-central Ethiopia. Human skeletal evidences were recovered from pre Aksumite and Aksumite period (D'Andrea et al. 2011; Fattovich and Bard 2001; Finneran 2009; Phillipson 2009; Phillipson et al 1995). These human skeletal bones were barely preserved. Thus, there is no evidence of mummified human remains recovered from pre-Aksumite and Aksumite archaeological site. The challenge was not the absence of mummified remains but the objective of the anthropological research.

The large volume of published studies describes the role of art history and architectural history of the prominent rock-hewn churches (Lepage 1997; Gervers 2003), iconography and liturgy (Fritsch 2008), geology (Asfaw 2002, Asfaw 2009, Asfaw et al. 2012,) and archaeology (Phillipson 2009, Finneran 2012). Asfaw suggests that

rock type is a major factor in the selection and carving of caves in Ethiopia. He concludes that builders of the rock-hewn caves had knowledge about the rock types. The majority of the works have been focused on Lalibela rock-hewn churches. Relatively, the cave churches are thoroughly researched than mummies, or the people who lived and practiced the culture in a given monastery.

Several monasteries such as the YK, AM, DS, Genete Mariam, Emakina Medhane Alem, Lidetta Mariam, Zammadu Mariam, Nactu La'ab, Tseha Michael and Lalibela rock-hewn churches contains mummified human remains. However, the remains are poorly protected and faced imminent danger of destructions from natural and artificial factors.

The extraordinary preservation and the long history embedded within the material culture provide invaluable insight into a little-known part of medieval Ethiopian history. Data about post-Aksumite archaeology remains were scarce. In recent years, researchers have struggled with reconstructing the history of medieval Christian highland Ethiopia. It is becoming increasingly difficult to ignore the post-Aksumite period.

Very limited research has been conducted on the mummies and mummification practices in Ethiopia. Most of the researches were focused on the cave ignoring the very people who engrave, carve or occupied them. Although the origin of mummification in Ethiopia and Eritrea is unknown, thousands of well-preserved mummies were discovered in the country. Thus archaeological and bioarchaeological studies in the post Aksumite period could shed more light on the little-known history of medieval Ethiopia.

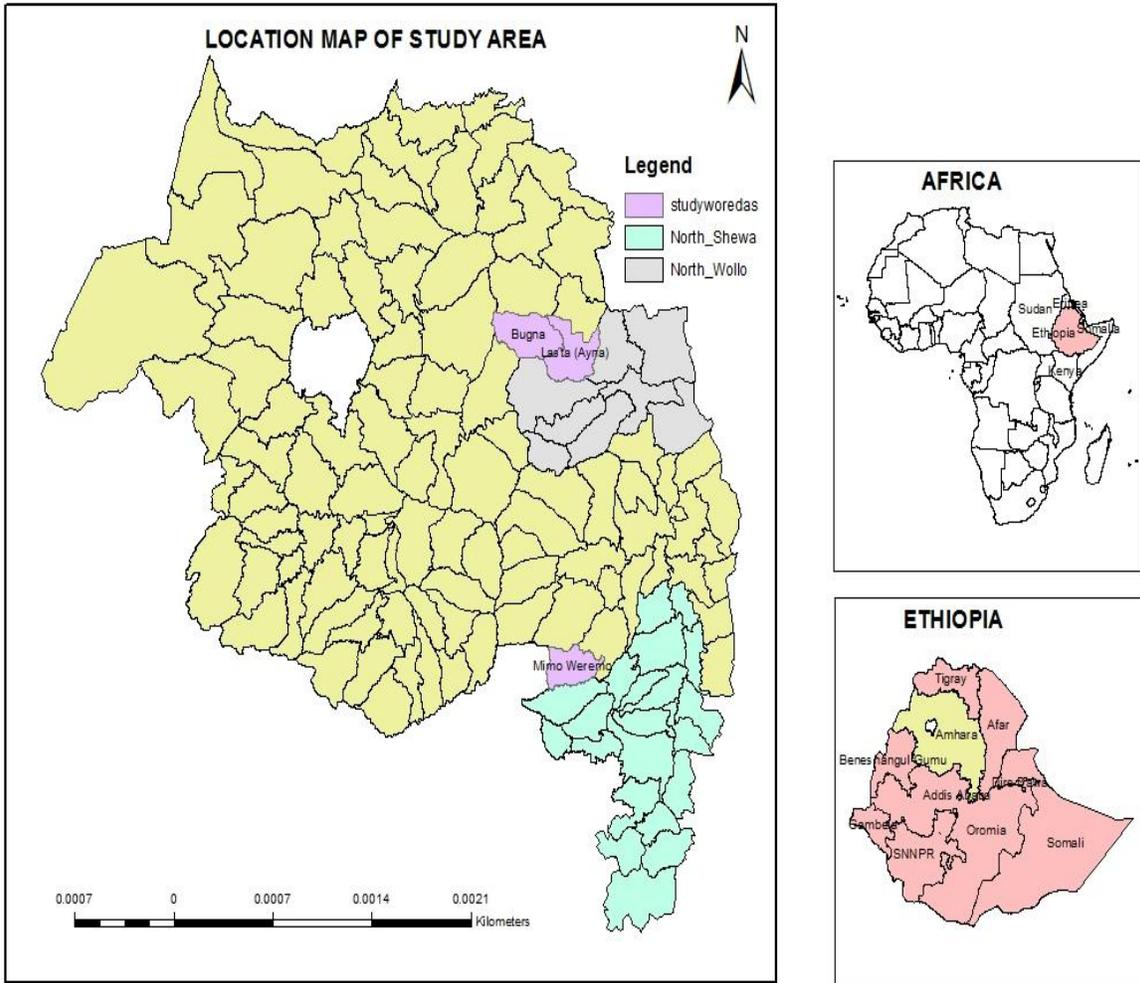


Figure 4-1. Map of the study sites: The relative location of Mida Woremo and Lasta Woreda in Amhara Region in Ethiopia. Photo credit: Muluembet 2016)

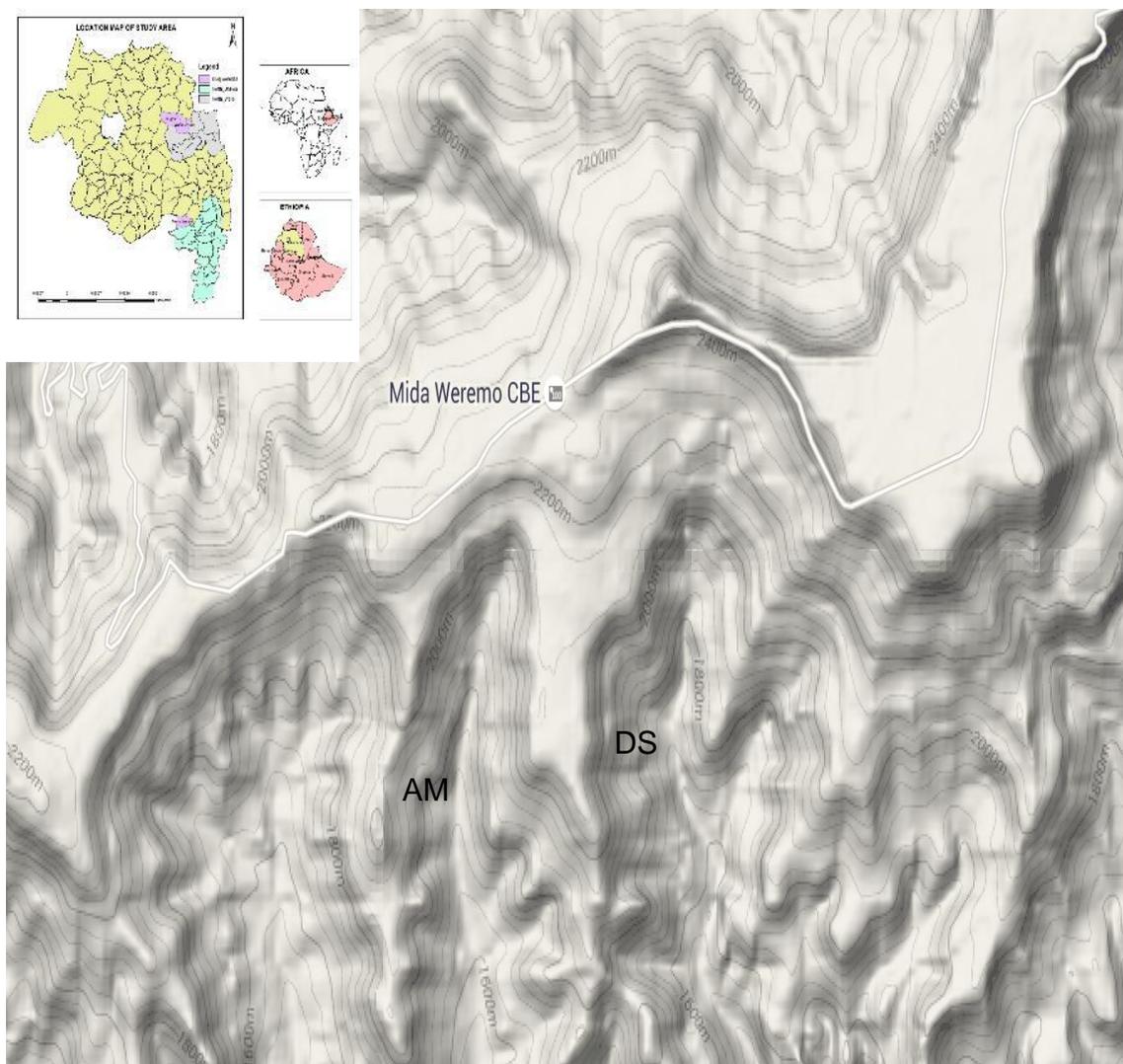


Figure 4-2. Elevation of the Mida Woremo in central Ethiopia. Both the AM and DS caves are located near Meragna town located at an altitude of 2400 MSL and the sites are found at a lower elevation at 1800 masl (modified from Google Earth map 2016).



Figure 4-3. Photo taken in the 2013 field season showing the cave of Tseha Michael monastery: A) a subterranean cave where we walked for three hours and could not find the end. B) It was a burial ground used by the local people. C) Mummies found in the cave but several hundreds of them were broken and stacked at the back of the cave. D) Shows granaries used to keep grains during drought season but the date is unknown. Photo credit: Abiyot 2013



A



B

Figure 4-4. Kara Meshige Fort. A) the fort was constructed during the Queen Yoddit Guddit of Aksum, the wall is 400 meters by 3 meters length and height a strategic location used to separate North Shewa from the South Wello. According to the oral tradition the wall was constructed with countless number of human fingers. However, during the archaeological survey in 2013 and 2015 could not find any human remain. B) the aerial view after the fort where I am standing in Northern Shewa and the furthers hill is South Wello. Photo credit: Abiyot 2015



Figure 4-5. The YK indigenous forest and degraded landscape. A) Google Earth Satellite areal view of the YK indigenous forest and the surrounding degraded landscape. B) photo taken during the 2015 fieldwork in YK showing a partial view of the natural forest coverage in YK cave monastery. Photo credit: Abiyot 2015



Figure 4-6. The unimpressive exterior wall of YK. Photo credit: Abiyot 2015



A



B

Figure 4-7. The YK cave church and partial view of the palace A) photo taken in 2013 show the front side of the church, B) shows the back view of the church where the tomb of YK was also protected with a small brick fence and covered with red colored cloth. It was built alternatively with gravel stone and woods. Photo credit: Abiyot 2015



A



B

Figure 4-8. The condition and extent mummies particularly, how they are commingled and disarticulated. All the mummies were stacked at the back of YK cave church. A) Photo taken in 2013 field season shows thousands of human corpses partly skeletonized and partially mummified. A diseased individual buried with the burial coffin was completely skeletonized; B) shows part of the mummies at the back of the cave where it further continuous to the far back end where the distance is about 30 meters from the fence seen in photo A to the end of the cave. Photo credit: Abiyot 2013



Figure 4-9. The tomb of King YK dated back to eleventh century based on new carbon dating. The tomb is found very close to the church signifying the status of the individual. Photo credit: Abiyot 2013

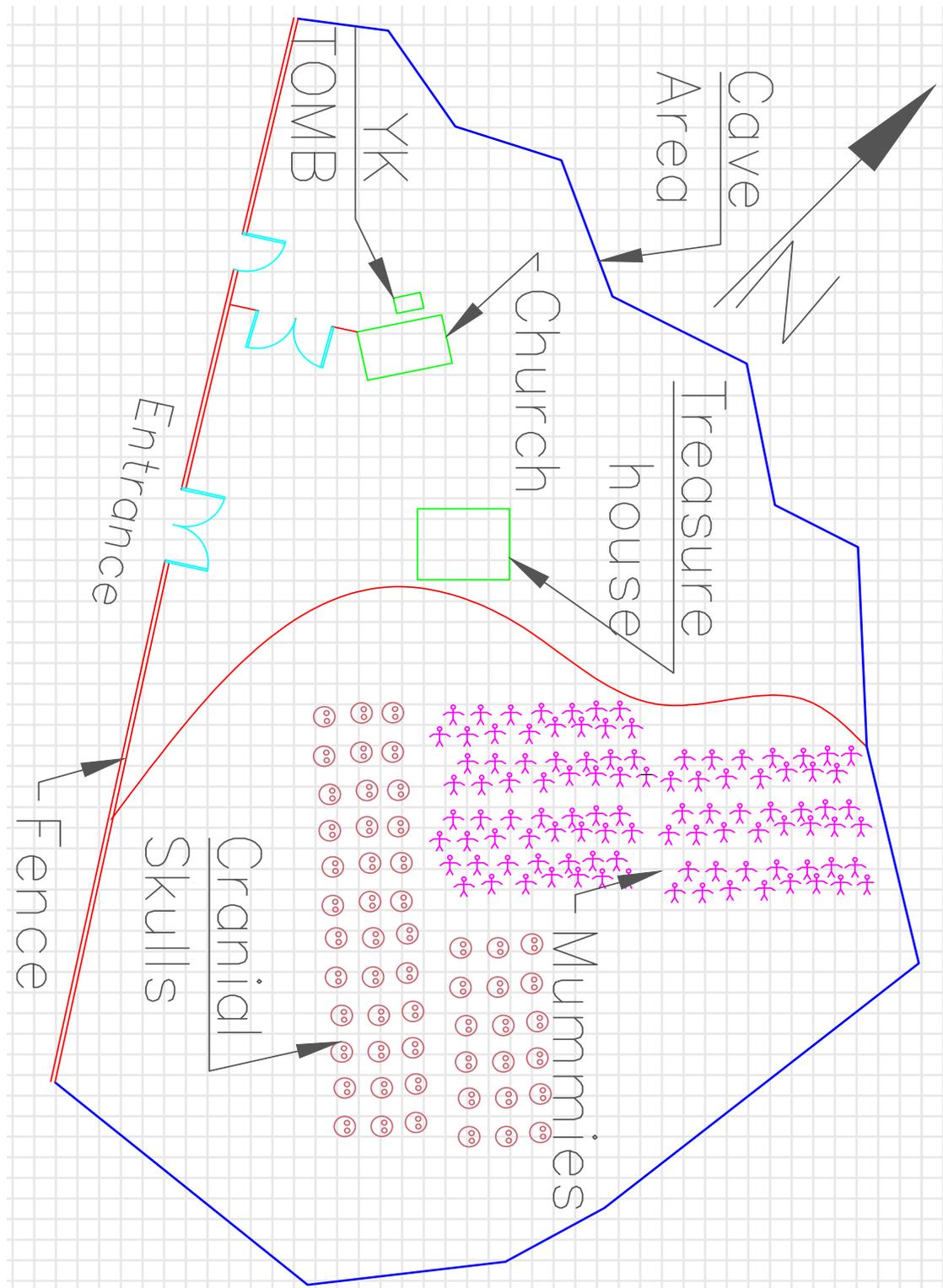


Figure 4-10. Site map plan of YK. The position of the mummies and skulls reflect the current position after the field work.



Figure 4-11. The newly reconstructed cave church and series of retention walls to expand the AM cave monastery. The construction of the wall was initiated after handful of followers fell down due to a landslide. Photo credit: Abiyot 2013



Figure 4-12. Mummified humans composed of different social status: Priests', Monks, Deacons, Nuns and Followers found in AM cave monastery. Priests' hands were crisscrossed and placed on the opposite shoulder, as a symbol of Christ's cross. Monks' and nuns' hands were placed on their eyes and ears, with the objective of indicating that they secluded themselves from the secular world. Deacons' hands were put on their shoulder to show their obedience in life as a minister. Followers' hands were placed on their private parts (genital organs) to emulate Adam and Eve, who became aware of their body and their sins. Photo credit: Abiyot 2013

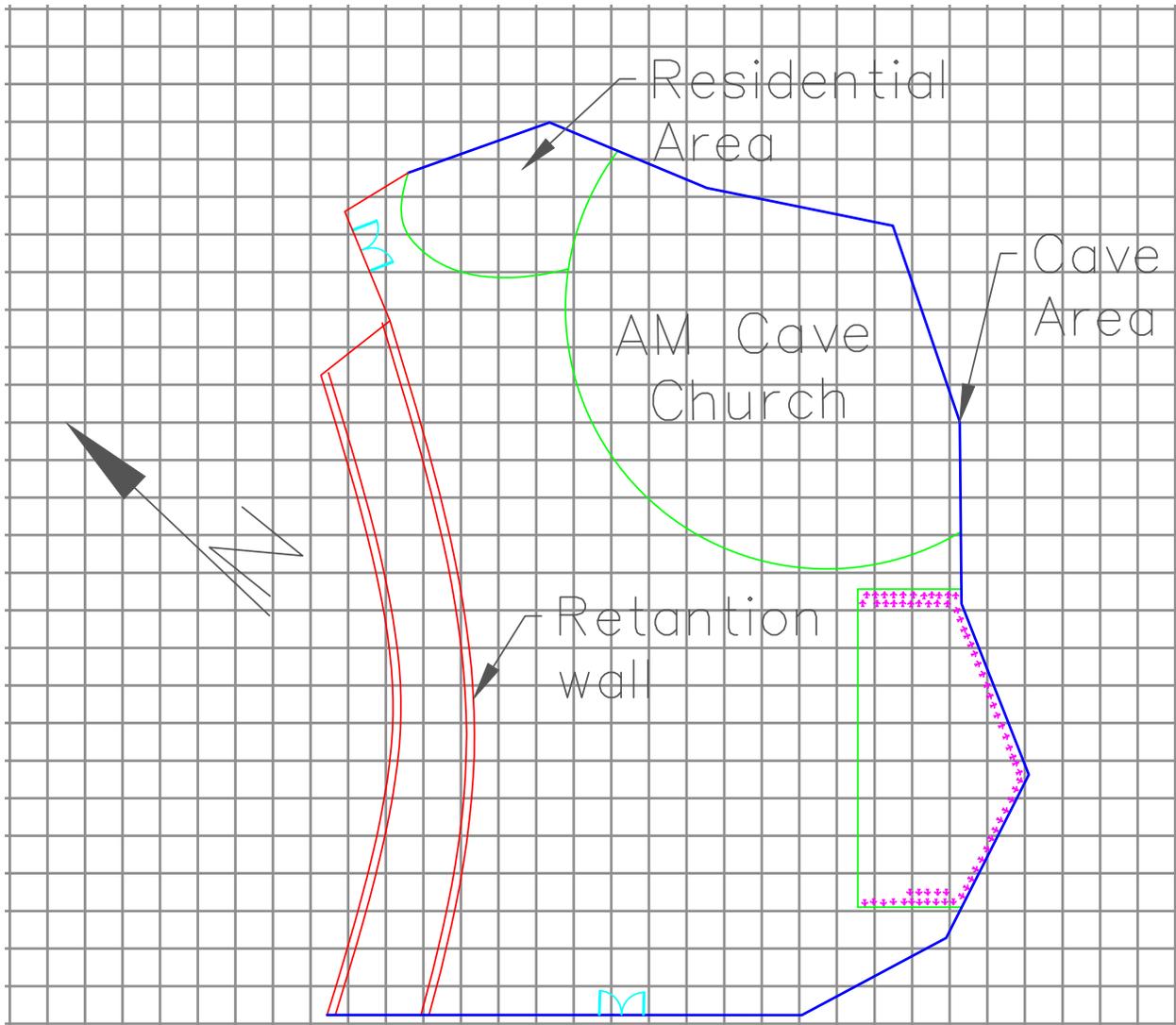


Figure 4-13. AM site map.



A



B

Figure 4-14. DS cave monastery A) Photo was taken in 2013 field season where the old church painted for annual monastery celebration. Photo credit: Abiyot 2013 B) photo taken in 2015 field season where the old church was demolished and the new church was built in its place. Photo credit: Abiyot 2015



Figure 4-15. Child mummies from the DS church were found in a secondary deposit. These child mummies were uncovered from a burial tomb, multiple interments. According the local priest, the multiple interments reveal an episodic event in the past possibly epidemic disease or drought, where children are more susceptible than adults. Photo credit: Abiyot 2013

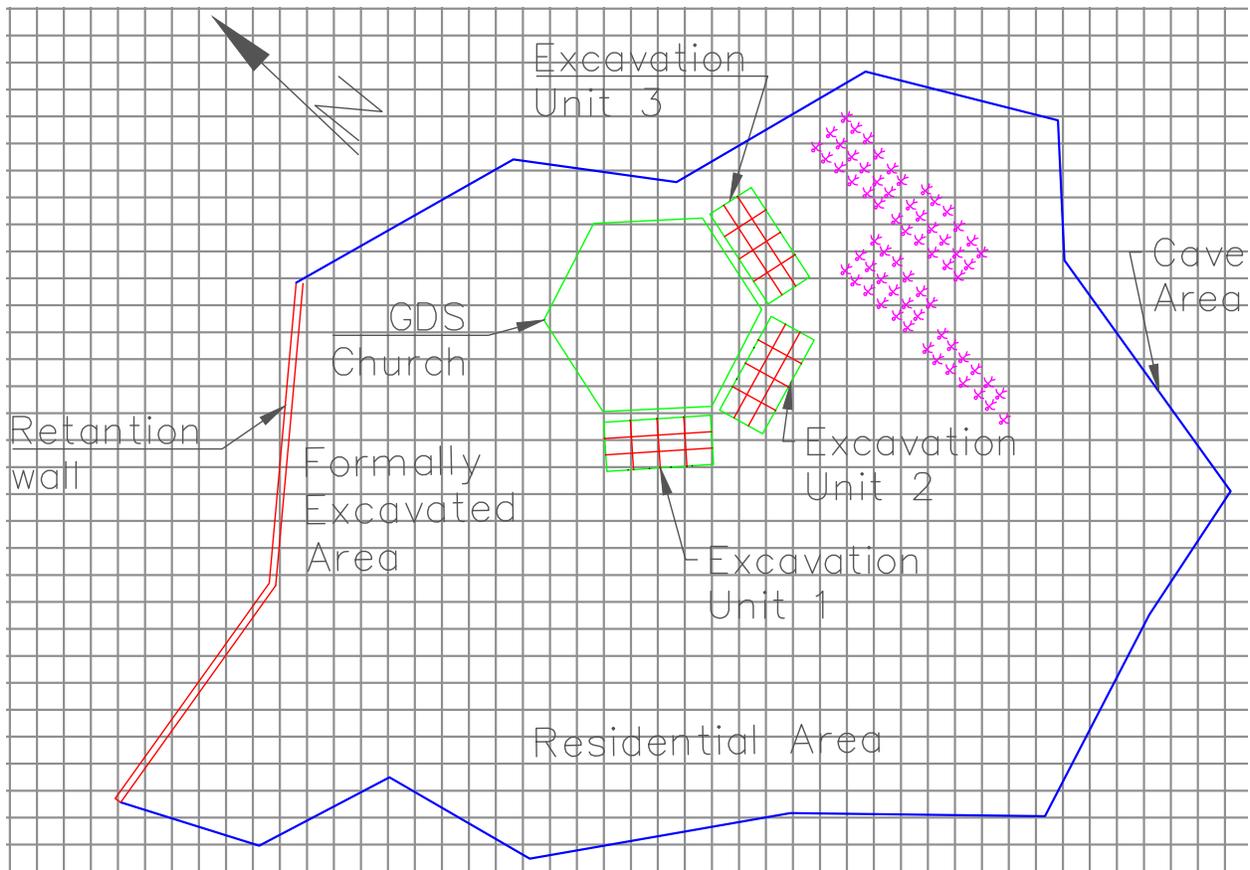


Figure 4-16. DS site map shows the location of the excavation localities and the mummies. The entire area surrounding the church was excavated.

## CHAPTER 5 ARCHAEOLOGICAL SURVEY AND EXCAVATION OF SELECTED SITES

Chapter 5 further explains the preceding chapter by presenting methods of data collection and analysis for the archaeological survey and excavation of the study sites. The chapter also further describes field data acquisitions and lab analysis methods. The excavations in the DS cave monastery also provide insightful data about Orthodox Christians burial traditions, which would have been impossible otherwise.

### **Reconnaissance Survey**

Study sites were designated through the use of archival research (Anfray 1985; Assefa 2014; Buxton 1972; Mengistu 2004; Phillipson 2012; Sergew 1972; Tadesse 1972), monastery documents and oral history. The survey results were used for evaluating site significance for the dissertation. A research team composed of the principal investigator and antiquity officers conducted reconnaissance surveys without any test excavation in north and central Ethiopia during the summer of 2012. The research team identified clustered cave churches in Mida Woremo, Bugna and Lasta. First, the Mida Woremo cluster includes the AM, DS, Tseha Michael and Washa Gabriele. Secondly, the Bugna cluster includes the YK, Bilbala Giorgis and Arbatu Ensessa. Thirdly, the Lasta cluster includes 11 rock-hewn churches of Lalibela, namely: the Bete Mariam, Bete Medhane Alem, Bete Meskel, Bete Denagel, Bete Golgotha, Bete Debre Sina Bete Gabriel, Bete Merkorios, Bete Amanuel, Bete Abba Libanos and Bete Giorgis. Of all the clusters, cave monasteries found in the Mida Woremo and Bugna produced the desired mummified human remains for this study. However, most of the rock-hewn churches provided limited numbers of mummies. The challenges further compounded as religious authorities sealed a catacomb containing mummified

human remains and reburied an unknown number of mummies. Attempts to view the secondary burial ground were unsuccessful. As a result, mummies located in the YK, AM and DS cave monasteries are subjects of this study. The DS site was the only site where an excavation permit was secured and selected for excavation. The inclusion or exclusion of a cave monastery in the dissertation depends on three factors: physical accessibility, restricted access to mummified remains and safety.

First, regarding site accessibility, the Tseha Michael and Washa Gabriel cave monasteries are remote and inaccessible and as such were excluded from the survey. For example, I had to travel inside a semi-subterranean tunnel down the hill for 1000 meters, which is extremely risky (Figure 5-1). Despite the challenge, preliminary data about Tseha Michael were included to provide baseline data for future anthropological studies in Chapter 4. Physical access to the YK was limited, due to transportation challenges. While Lalibela has a daily flight from and to Addis Ababa, the 42 km distance from the Lalibela to the YK village was a treacherous road. As a result, a public transport service bus was not assigned but a rental car at a cost \$50 US dollars could be used to travel to the site. Surprisingly, a concrete paved road was built for the YK with a donation from UNESCO.

Further to the south, the dry-weather road to Meragna, the capital of Mida Woremo Wereda in the Northern Shewa was comparatively better than the site in the Northern Wello. A public transport bus runs every Sunday to Meragna town. As an option, a rental four-wheel drive vehicle is an alternative, but due to the dry-weather road, car breakdown was typical and costs three times more than equivalent transportation to the YK cave monastery. For example, after the supervisory visit of Dr.

Brandt in the AM site in 2013, the rental car malfunctioned in the middle of nowhere. Another similar incident occurred in the following year where I was forced to return back and reschedule fieldwork.

Both the AM and DS sites are about 5 km from Meragna. However, the cave monasteries were found in the middle of a cliff. Fortunately, Menschen für Menschen, a Non-governmental organization, built the 836 stairs to the AM site. However, similar paved stairs were not constructed for the DS. The grueling daily travel, logistical factors and restriction of the supervisory committee affected decisions about inclusion or exclusion of mummies.

Secondly, restricted access to mummified human remains was another factor for the inclusion or exclusion of the sites. The YK, AM and DS are accessible. Most importantly, I received fairly unrestricted access in the DS particularly to conduct excavation (Figure 5-2). In the YK, I have also got access to take pictures of crosses uncovered during the expansion of the monastery (Figure 5-3).

Safety was the third factor considered in the inclusion or exclusion of a site. Sites selected for this study were relatively safe, except for the DS cave monastery where there was no paved access to the site and imminent danger from a dissatisfied group of people. A local supervisory committee, composed of police, the antiquity officer, a community leader and church representatives, were monitoring the research work in all locations. Despite their interference in obtaining samples, committee members were instrumental in ensuring research crews' safety. The Tseha Michael and Washa Gabriel were excluded from the study due to safety concerns and site accessibility.

## **Field Data Collection**

### **Field Assistants and Workers**

Field assistants and temporary workers were crucial for field data acquisition. A total of 148 individuals were employed to assist the field data collection process (Figure 5-3). Of this number, 18 were field assistants and 130 were temporary workers. Six field assistants from each site, namely the YK, AM and DS, were recruited based on their educational background, local knowledge, cultural understanding and familiarity with the physical landscape. At the beginning of each summer season's fieldworks, field assistants at each site were trained in archaeological field methods such as survey, excavation, photography and the use of osteometric tools. I closely monitored the process of site selection, excavation and osteometric measurements to ensure the quality and validity of the data.

Field workers assisted with the heavy tasks such as removing huge piles of dirt, carrying mummies outside of the storage room for investigation, returning them after the completion of the work, recording extracted metric data and assisting with excavation (Figure 5-5). The number of temporary field workers varied from site to site, depending on the workload. A total of 120 individuals were involved in the process of excavation for almost two weeks at the DS cave monastery, where 10 field workers were employed for a day to transport huge piles of soil to facilitate the process of excavation for 12 days. They were divided into two groups of five individuals. Each group worked intensively for three hours due to difficulty of the workload and imminent danger of health risk from the dust. However, five additional temporary workers were recruited for each of the AD and YK caves to prepare the mummies for inventory, as the workload was easier than at the DS.

## **Archaeological Field Survey**

Surveys of cave monasteries were selected for five reasons. First, reconstructing mummification practices in Ethiopia requires data on the subject. Cave monasteries have a better likelihood of preserving mummies than open-air burial graves. Secondly, reconstructing the role of diet in determining social status during ancient and medieval Ethiopia requires samples for isotopic analysis. The sample for the analysis could be well preserved and less contaminated in cave burial settings. Thirdly, investigations of diachronic changes in the practice of mummification (e.g., the beginnings of spontaneous, artificial and/or spiritual mummifications) are best situated at cave monasteries with prolonged mummification practices. The use of open-air burial graves was restricted and likely to have a single burial that could not show diachronic changes. Thus, cave monasteries would more likely have multiple burials and a better chance of refining the practices over an extended period. Fourthly, data regarding site comparisons could be found at cave sites as most of the saints, and subsequent foreign religious pilgrims, settled in cave sites (e.g., YK, Lalibela). Finally, survey and excavation of burial graves in Ethiopia are off-limit for such archaeological and osteological investigation.

Three field seasons were conducted yearly, in 2013, 2014 and 2015 at the AM, DS and YK sites, which are active religious sites. As stated above, cave monasteries were selected primarily based upon the presence of exceptionally well-preserved mummified human remains coupled with relative research site accessibility.

Additional reconnaissance surveys and inventories of mummies were conducted with the help of field assistants. Archaeological surveys were carried out in the Jamma Valley and Tseha Michael cave monastery. The total area covered by the pedestrian

survey was 30 meters by 20 meters. Trace fossils, marks left by unidentified plants leaves, were recovered from rocks in Dongore in Mida Woremo, Semien Shewa Zone in central Ethiopia. Sample specimens were collected and submitted to the Department of Geology at Addis Ababa University for further analysis. Kara Meshige Fort was another important archaeological site surveyed in 2013 and 2014. A group of five individuals covered the main garrison station, which was equivalent to a football stadium. According to oral tradition in the area, the fort was constructed during Yoddit Guddit in the Aksumite Period and was used as a battle station for major wars in Ethiopia since Aksumite (Chapter 3).

Further north, similar pedestrian surveys were carried out in Lasta Woreda, particularly in the YK, Lalibela and their surrounding environs. The majority of mummies was removed from their original deposition and stacked in a secondary location. For example, in Lalibela, there were several mummies but most of them were collected and reburied. During surveys in 2013, 2014 and 2015, empty catacombs were found and documented. Originally, catacombs were used for prayer but later used for burial purposes. Most of the corpses were removed and reburied in another location. However, two or more mummies were still in the Lalibela rock-hewn church covered by a temporary fence. Attempts to access these mummies were believed to be sacred and the site was an active religious site.

During archaeological survey documentation, a total of 221 mummies and 57 skulls were collected from the three sites: AM (68 mummies), DS (65 mummies), and YK (88 mummies) (Chapter 6). Uniform coding was used for all sites where site name was followed by status and sex of a mummy (Table 5-1). All of the mummies were

selected following systematic sampling. However, several various variables affected the systematic sampling strategy designed to select mummies, such as the unknown number of mummies, secondary deposition, orientation, physical condition and nature of preservation of mummies in a monastery.

First, the number of mummies was unknown in the study sites hindering the determine of statistically representative samples. For example, according to oral tradition, the number of mummies in the YK was estimated to be between 5000 and 11,000. Nevertheless, because of human intervention for the expansion of the church and pieces of the mummies having been stolen by the locals for medicinal purposes, thousands of mummies were pulverized.

Secondly, most of the mummies were deposited in their secondary depositional location (e.g., those at the AM and YK sites were from secondary deposition). However, of the total 221 of mummies, 13 were uncovered in their primary/in situ deposition in the DS, while the remaining 209 were found in their secondary deposition. Thus, identifications of the positions of mummies were difficult, as they were intermingled (Adams 2004). Adams (2004) also states that identification of commingled bones is difficult as the number of variables multiply with unmixed individuals.

Thirdly, the orientation of mummies affected the design strategy. Unfortunately, all of the mummies were relocated and recollected from different places. Hence, all data related to orientation have been lost.

Finally, the nature of preservation was another factor considered in the inclusion of mummies in this study. Numerous mummies were destroyed, particularly in the DS and YK sites. Mummies partly preserved and fully skeletonized were excluded, except

informative skeletal parts (e.g., skull). Comparatively preserved and informative mummies were included to extract more valuable information.

### **Excavation: Golden Opportunity and Challenge**

In Ethiopia, it is difficult, if not impossible to excavate active religious Christian burial sites. Fortunately, this study was carried out during the same time as renovations occurred and, therefore, the study perfectly aligned with the interest of the stakeholders. DS ecclesiastical authorities facilitated the permit for renovations of the monastery. A select committee from a representative of the monastery, local community, police and Culture and Tourism Bureau of Mida Woremo formed the Debreguad Selassie Renovation Committee (DSRC). DSRC worked on behalf of the local community to raise funds and mobilize local people to rebuild the cave monastery. If not for these local advocates and their willingness to include anthropological research, this research would not have occurred.

DSRC discussed plans and strategies to rebuild the new church. After intensive debate, the committee was successful in alleviating stakeholders' concerns and moved forward with the construction plan. According to the chair of the committee, the main points of the accord included: first, to guarantee that local people voluntarily removed their relatives' corpse buried in the planned construction zone and to support renovations of the monastery by providing voluntary service; secondly, to assist the local Cultural and Tourism Office experts to survey the area and supervise the excavation process; and third, to ensure the police provide safeguards for the church and movable cultural heritage (e.g., human remains and artifacts).

The understanding between the project and stakeholders facilitated the process of excavation. Furthermore, stakeholders were trained on the research objectives and

standardized archaeological excavation procedures. The ecclesiastical authorities, in favor of more systematic excavation methods, agreed to halt the random excavation and renovation work on the site.

According to priest living in the cave monastery, renovations of the church were initiated in 2010, using a private donation of five million Ethiopian birr (or \$250,000 USD). Moreover, the local communities contributed additional materials and free labor support. Between 2010 and 2013, they actively engaged in excavating the cave. Hundreds of mummies were recovered and reburied. However, burial graves closer to the old church were not excavated, although the excavation partly revealed graveyard markers such as logs, pieces of reed mat and stratigraphic layers.

Archaeological finds recovered from the monastery were reused. According to Gobeze, Chairperson of the Committee, grains, pots and crosses were recovered. The grains were consumed and the pots were broken. The crosses, made of either wood or iron, were in excellent condition. Of all recovered crosses, a big iron cross was registered as a tangible heritage of the church. According to the Ge'ez engravings on the cross, the wrought-iron cross was crafted during the reign of Menelik II (1889-1907). Similar crosses were recovered from the YK site dated to the beginning of the church (Figure 5-3).

The height of the constructed retention wall was 17 meters at its highest point, with a length of roughly 255 meters (Figure 5-4). Despite the available funds, labor and effort to build a masonry retention wall, its structural integrity was not adequate to withstand the extra load of the soil and stones. Furthermore, the contractor failed to submerge water pipes and used poor-quality construction materials. Inevitably, the wall

collapsed and hundreds of reburied mummies were reportedly destroyed, as they were flooded down to the gorge.

Regrettably, neither the church nor the Woreda Cultural Tourism Office attempted to salvage the mummies. Consequently, some of the mummies that could have survived were destroyed and washed away by the intermittent river gorge, which emanates from the front of the cave. The collapsed retention wall was the cause for the firing of all DSRC members. Subsequently, a newly-elected committee did not attempt to salvage the mummified remains flooded to the gorge. Perhaps, the reasons for not rescuing the remains were related to financial constraints and limited knowledge of how to do so.

Most of the construction materials and excavated soil were temporarily dumped closer to the church. Clearing all of the dumped materials from the selected localities was a challenge. Nevertheless, the portion of the burial graves closer to the church were not disturbed and provided an opportunity for this study.

The localities were selected based on surface findings, proximity to the old church, hauling/transporting distance to dump the excavated soil and the structure of the grave. Moreover, I surveyed areas with the highest concentration of burial graves. Surface findings were crucial for the determination of the localities. The three localities were selected partly based on surface findings and features such as mummified remains, ecofacts (e.g., grains) and artifacts (e.g., crosses, cotton sheets and palm mats).

Burial proximity refers to the burial grave distance to the center of the church. Higher-ranking individuals, such as priests, nuns, monks, deacons and elites, are buried

closer to the church. Among them, those individuals who were spiritually well advanced were buried inside the church and towards the center where the altar is located.

Information from the monastery explained this burial proximity, where the closer the burial graves were to the church building indicated the higher status of the individual.

Multiple interments in a grave were another criterion used to select the locality. Living priests, monks and elders provided additional information regarding the location of multiple interment burial graves in the DS. Family members often used multiple interment burials for many generations. One of the selected localities includes this type of burial.

Access and transportation distance to dump fine-grained excavated matrix were additional factors considered in selecting the localities. Some parts of the cave monastery were inaccessible due to the relative height of the cave ceiling. The transportation of huge piles of matrix consumes time and budget. Moreover, areas at the back of the church were far and inaccessible.

### **Archaeological Excavations of the DS**

Martin (2014: 2706) explains that archaeological excavation is a method used to “define, retrieve and record cultural and biological remains found in the ground”.

Excavation is the last resort in the process of archeological data collection; hence, it is a deliberate destruction for the reconstruction of the past (Clark 2003; Martin 2014).

Unfortunately, most of the mummified human remains were moved from their original positions. Data obtained from test excavations were supposed to be conducted in all sites to get contextual information. However, because of restrictions imposed by the church, one cannot get the permission to conduct any sort of excavation, particularly in active burial sites.

As explained in Chapter 4, excavation of the peripheral area of the monastery was started in 2010. A retention wall was constructed between 2010 and 2013, to prevent landslides and to expand the cave monastery. Construction materials and excavated soils dumped near the church were cleared.

**Excavation materials and datum.** The cave site was easy to excavate, as sediments in the burial grave were porous and not compacted. Excavation tools such as shovels, hammers, nails, markers, strings, line levels, plastic bags, knee pads, dust pans, screens, trowels and cameras were used. An excavation grid measuring 3 meters by 4 meters was set up to record the location of each grave. Then the datum point was selected where all measurements were taken from this stable benchmark. It was also important to control the stratigraphy intervals. Arbitrary intervals were adopted, where the levels were changed at every 10 centimeters.

### **Excavation Locality I**

Locality I was positioned north of the old church on the western portions of the cave. It contained four burial graves. The matrix consisted of brown soil and showed no signs of disturbance. The locality yielded four mummified human remains, of which three were adults and one was a child (Figure 5-5). No artifact assemblages or features were associated with the bodies. The burial graves were oriented east-west, where the head of a deceased individual was facing toward the west, and the body positioned posteriorly. According to the local tradition, it is believed that, at the Judgment Day, when Jesus Christ comes from the east, all deceased individuals will be resurrected and rise from the west facing toward the east.

**Burial Grave I.** A child mummy was exhumed at the third arbitrary level around 45cm from Burial Grave I. The matrix of this burial grave was loose and dry brown soil.

The next arbitrary levels revealed no trace of artifacts or ecofacts and as a result, the excavation was abandoned (Figure 5-6).

The child mummy, coded as DSFI1, wrapped with a cotton sheet and timber leaf, was remarkably well preserved. After cleaning the dust thoroughly, I untethered the cord on the head for further macroscopic evaluation and determined the biological profile. Based on visual examination, the presence of male genital organs made sex determination an easier and straightforward assessment. The age of DSFI1 was estimated to be between one and three years, mainly because the sagittal and coronal sutures were not closed. The growth of four frontal milk teeth on the upper and lower jaws and absence of molar teeth were useful parameters in determining the approximate age of DSFI1. The hands were placed on the genital indicating the status of the mummy, a follower. Although the status was grossly categorized as a follower, the status of DSFI1 within the follower was unknown. Nevertheless, there was an indication that the boy belonged to a higher social status family. The area close to the church, as indicated above, was often reserved for the elite. The fact that the mummy was buried in proximity to the church and three other bodies might explain his family status.

It was not possible to determine the relationship between the two men and the woman. Further genetic analysis is needed to prove kinship relationships. However, there was a higher probability that the child might be related to the woman. If this assertion holds, the child died and was buried first, and the mother followed, as mothers often wished to be buried next to their children. According to Ethiopian Christian tradition, it is a common practice for family members to be buried next to each other or in the same grave.

**Burial Grave II.** This interment was situated in the same locality as Burial Grave I. The objective was to determine what sort of variation, if any, existed between the two burial graves. As the graveyard was placed closer to the church, there was also the possibility that the mummy would yield additional information. Interestingly, the excavation revealed a female corpse at 57 cm depth and was coded as DSFF2 (Figure 5-7).

The height of DSFF2 was 157 cm and the width, at its maximum point, was 60 cm. Both the mummy and wrapping materials were well preserved. It was wrapped with a cotton sheet and palm mat. Sex determination was based on a non-metric assessment.

DSFF2 shows less prominent supraorbital ridges and a sharper superior orbit. More importantly, the preservation of breast tissue on the chest made sex determination easier. It was a middle-aged adult woman. She was buried closer to the church compared to other female mummies. This perhaps indicates that DSFF2 was from a high-ranking family. The mummy status was identified based on the position of both hands, as all followers of Orthodox Christianity placed them on their genitals (Chapter 4). DSFM2's hands were placed to cover her genital organ. No evidence of pathological or body injury was observed on the mummy. The abdomen of the mummy was collapsed, perhaps removed during the preparation of the body to prevent decomposition.

**Burial Grave III.** It was found near Burial Graves I and II. DSFM3 was uncovered at a shallow depth of 35 cm (Figure 5-8). Sex identification of DSFM3 was based on the sexual dimorphism, mainly by the prominent supraorbital ridges, and

blunter superior orbits coupled with the presence of a male genital organ were conclusive of the sexual orientation. Metric age determination, such as degeneration of pubic symphysis, pelvic articular surface and sternal ends of the ribs were not assessed because of limited access to advanced technologies such as CT scan or X-ray. However, the dental attrition and physical stature suggest that DSFM3 was an aged adult.

The height of the mummy was 185 cm and width, at its maximum point, was 60 cm. DSFM3's hands were placed to cover his genital organ. The proximity of the burial grave to the church might indicate that he belonged to an elite class. Macroscopic examination revealed no pathological or trauma on DSFM3.

**Burial Grave IV and Burial Grave V.** The DSFM4 and DSFM5 mummies were exhumed from Locality I. Methods included excavation of 120 cm x 189 cm to a maximum depth of 90 cm. A huge pile of aeolian deposit was removed before the two mummies were exposed. The sediments were fine grains in texture (Figure 5-9).

There was no damage to the mummies and each was well preserved. Sex determination was based on the presence of male genital organs. Both DSFM4 and DSFM5 were middle-aged adults as there was no evidence of dental attrition or visible bone degeneration. The status of the mummies was inferred from a placement of both hands on the genitals. The study could not find any possible causes of death, as neither a life-threatening pathology nor trauma was discovered on either.

## **Excavation Locality II**

**Burial Grave VI.** The DSFM6 mummy was exhumed from Locality II (Figure 5-10). Methods included excavation of 65 cm x 189 cm to a maximum depth of 45 cm. DSFM6 was well preserved and there was no damage on the mummy. Sex

determination was based on the presence of a male genital organ. DSFM6 was a middle-aged adult as there was no evidence of dental attrition or visible bone degeneration. The hand of DSFM6 covered the genital organ, indicating the status of the mummy. The study could not find any possible causes of death, as neither life-threatening pathology nor trauma were found on DSFM6.

**Burial Grave VII.** It was found next to Burial Grave VI. DSFM7 was also oriented north to south, similar to DSFM6. The burial orientation of DSFM7 was also a secondary deposit, and the original burial grave could be used for multiple interments.

Similar methods used to determine sex and age of DSFM6 were applied to DSFM7, and the latter was determined to be an adult male. The height of the mummy was 179 cm and the width, at its maximum point, was 65 cm. The cause of death is not known as no visible trauma or pathology were recorded.

Strangely, DSFM6 and DSFM7 were oriented north to south. Asked about the orientation anomaly of the mummies, some of the priests explained that the deviation in orientation might have been due to various factors such as shortage of space, the status of the mummies, the will of the deceased and gravedigger preference. A secondary deposit and the original burial grave could be used for another individual.

The locations of a burial place, in the DS in particular, and in the country in general, are determined by the availability of the desired space. Indeed, this does not include those who already inherited burial graves from their ancestors. In the absence of a designated area, church officials and gravediggers select the burial chamber.

The status of an individual is the fundamental factor for the allocation of the burial space. The higher the status, the more likely is the chance of getting a desired spot. In

most cases, burial space for the ecclesiastical authorities is designated in advance. The burial chamber starts from the inner spot inside the church, which often reserved for the highest priest. For instance, according to oral tradition, both Abba Bereded (founder of DS) and Abune Melke Tsadik (founder of AM) were buried inside the church.

In some cases, a person predetermines a burial place in advance by his/her wishes regardless of the orientation of the other burial graves. Depending on the status of the deceased, the living negotiate and renegotiate based on the wishes/will of the deceased. The wishes of the deceased are often associated with the ancestral spirit, and people tend to respect and implement the willpower, as stated by the deceased. Some people travel a long distance just to be buried in the cave church while others' bodies were transported to the place the deceased indicated in the willpower. Because of these unique circumstances, burial places are not strictly limited to the local communities.

Another factor that determines the orientation of a burial grave is the preference of the gravediggers. As they are intimately familiar with the orientation of the burial chamber, church officials often consult them before making the final decision. In the case of congested burial spaces, when a spot is found even facing north to south, families of a deceased individual often take the position.

### **Excavation Locality III**

**Burial Grave VIII.** The DSFM8 mummy was exhumed from the Burial Grave VIII at a depth of 190 cm. Most of the wrapping materials were decayed but small fragments of the cotton sheet and palm mat were preserved. Remarkably, DSFM8 was well preserved despite the decayed wrappings. This individual had a height of 175 cm and a width of 60 cm.

Similar to the previous mummies, DSFM8 was wrapped with cotton and then with a timber mat. The mummy was found in excellent condition. It was identified as a male and was estimated to be a middle-aged adult. No artifacts accompanied the interment of DSFM8 (Figure 5-11). According to the local priest, some people prefer to be buried without artifacts; religion and personal preference are the main factors for the absence.

Most of the body parts of the mummy were intact. However, the abdomen in this mummy, like others, was collapsed, indicating either the removal of internal organs or the use of preservative material to deter the growth of bacteria. In support of this, physical examination revealed no sign of dehydration. X-ray and further chemical analysis could produce more reliable results. Unfortunately, due to the strict policy of the church, neither X-ray nor chemical analysis was possible.

**Burial Grave IX.** Burial Grave IV was used for multiple bodies (Table 5-2 and Figure 5-11). A total of five individuals was exhumed. The deceased were unknown to the local communities. The grave was covered with wood logs, possibly used to prevent soil and other materials from entering the grave and also served as a burial marker.

According to the high priest in the church, multiple interments are very common in the DS, given the limited space inside the cave. Some of the burial graves, uncovered and reported by the local communities during expansion of the cave, contain seven mummified bodies. Unfortunately, the time period, their identity and the reason they were interred in one burial chamber, are unknown. Burial Grave VII was oriented in an east-west orientation (Table 5-2).

The mummy at the top was the oldest in burial age whereas the youngest in the burial age was at the bottom. When a new deceased corpse was buried, it was covered

with cotton and a timber mat. Plant remains such as Juniper – locally named *Tsid* – and timber leaf were used between the interments. All excavation graves were not backfilled because the entire area was under construction; accordingly, the next year the whole area was cleared.

According to the priest at the site, some of the burial graves have been used for generations. For example, when a member of the family passed away, the body could be buried in the same grave as previously-deceased members. As such, it is common to find multiple corpses in a single grave.

The multiple burial graves defy the law of superposition, where the bottom is older than the upper. In contrast to this, the fresh corpse is always placed at the bottom of the grave in DS. Gravediggers opened the grave and removed the old corpse and excavated the grave deeper to insure it would accommodate the new and the previously-deceased corpses. The fresh corpse is always placed at the bottom and the rest follow according to their original burial order. The entire process is strictly monitored mainly to not to upset the ancestral spirits who are believed to watch over the living.

### **Summary**

A total of 221 mummified human remains were documented and included in this study. Unfortunately, the majority (209) were recorded from a secondary depositional location. A total of 13 undisturbed mummies were excavated in the DS. The DSRC mainly facilitated the excavation permit because the church was under renovation. Proper archaeological procedures were followed to exhume corpses from the burial graves. A child and a woman mummy were uncovered in Locality I. Surprisingly, in locality III, multiple interments of the bodies of four men and a woman were discovered. Wrapping materials were the same for all, and no grave goods were discovered, a

typical characteristic of Christian burial in Ethiopia. Even though the AM was similarly under renovation at the time of the visit, church official declined to give permission to excavate the burial graves. As a result, mummies found in secondary deposits were documented.

The majority of mummies (133) were collected from central, and the remainder (88) was from northern Ethiopia. The religious group – composed of mummies of priests, monks, nuns and deacons – represented 63% (141), while followers amounted to 27% (80) of the total of 221 corpses. Unsurprisingly, the total number of men is three times higher than women, possibly indicating the patriarchal society, where men control more of the resources. The proportion could also prove that men traveled a longer distance than women to reach this highly inaccessible monastery. According to the oral tradition in the YK, the majority of the mummies were from Egypt, Syria and Asia Minor (Chapter 3).

Table 5-1. Code used to collect data from all monasteries.

Site name	YK	AM	DS
Priest	YKP	AMP	DSP
Deacon	YKD	AMD	DSD
Monk	YKM	AMM	DSM
Nun	YKN	AMN	DSN
Follower	YKF	AMF	DSF

Table 5-2. Multiple interments of mummies excavated from Burial Grave VII.

<i>Burial ID</i>	<i>Sex</i>	<i>Height</i>	<i>Maximum Width</i>	<i>Depth</i>
DSFM9	Male	1.74	0.65	0.47
DSFF10	Female	1.52	0.59	0.96
DSFM11	Male	1.83	0.64	1.62
DSFM12	Male	1.87	0.78	2.13
DSFM13	Male	1.55	0.83	3.05

Table 5-3. Distributions of documented mummies form the YK, AM, and DS sites.

<i>Archaeological Site name</i>	<i>Number of mummies</i>	<i>Percent</i>
YK	88	40
AM	68	31
DS	65	29
Total	221	100



Figure 5-1. A semi-subterranean tunnel leads to the Tseha Michael cave monastery.  
Photo credit: Abiyot 2013



A



B

Figure 5-2. DS site selection and clearance for excavation: A) Selection of excavated area where some of the area was already excavated by the DSRC. Photo credit: Yibzawork 2013 B) Temporary workers selected to clear the area for excavation. Photo credit: Abiyot 2013.



A



B

Figure 5-3. Crosses excavated during cave church expansion. A) Recovered from YK site, B) recovered from the DS cave monastery, the textual engraving indicated it was prepared during the reign of Emperor Menelik II. Photo credit: Abiyot 2013



Figure 5-4. Debre Guad Selassie retention wall. Photo credit: Abiyot 2013



Figure 5-5. Excavation Unit One in Debre Guad Selassie Cave, field assistant Yohanis Sharew excavating Locality I. Photo credit: Abiyot 2013



Figure 5-6. Child mummy in Burial Grave I. Photo credit: Yibzawork 2013



Figure 5-7. DSFF 2 in Burial Grave II in the DS. Photo credit: Abiyot 2013



Figure 5-8. Burial Grave III in the DSFM3. Photo credit: Abiyot 2013



Figure 5-9. Burial Grave IV and V DCFM4 and DCFM5 in the DS. Photo credit: Abiyot 2013



Figure 5-10. Burial Grave VI of DSFM6 in the DS. Photo credit: Abiyot 2013



Figure 5-11. The multiple interment burial grave in the DS: Initially DSFM9 and DSFF10 were exhumed and DSFM11 was moved toward the scale to GSFM12 but GSFM13 was deep inside. Photo credit: Abiyot 2013

## CHAPTER 6 BIOARCHAEOLOGICAL AND OSTEOLOGICAL DATA OF MUMMIES FROM THE DS, AM AND YK STUDY SITES

Chapter 6 presents a description of the bioarchaeological and osteological methods used to collect data from the AM, DS and YK study sites and an analysis of data. Mummy inventory, physical anthropological analysis, and cranial analysis from the YK are presented.

### **Mummy Inventory**

Inventories of mummies were carried out in the AM, DS and YK study sites. With the data collected at that time, the inventory includes detailed information about individual mummies at each site based on careful documentation. Mixed and commingled mummies were excluded as any additional effort would have guaranteed physical destruction to the mummified remains.

The samples were identified based on a code assigned to the mummy in this site. Codes were constructed based on the first letter of the site, the category of a mummy and its sex. Based on the position of the arm of a mummy, each was categorized as a Priest, Monk, Nun, Deacon or Follower. A similar pattern of coding was developed and applied to all sites included in this study.

**Photography.** A Canon EOS Rebel T4i 18 megapixel digital camera was used to photo-document the sites and selected mummies. Photographs of all locations and individual mummies were taken using scales. The photographs are documented following the field code number given to the mummy and scale placed properly. The photographs are documented following the field code number given to the mummy and scale placed properly. Additional videos were also taken using a Canon EOS Rebel T4i

18 megapixel digital camera and Samsung tablet. Then, the data were transferred to two separate one-terabyte passport external drives to ensure data safety.

**Sketching.** A local art designer was hired to sketch the mummified human remains. The artist sketched wrapped and unwrapped mummies. In addition, site maps were prepared to elaborate and contextualize the sites.

### **Metrics Measurements and Analyses**

Metric measurements are crucial for comparative analysis and application of cranial indices (Decker 2011). Cranial measurements were taken as outlined by Buikstra and Ubelaker (1994) in the “Standards for Data Collection from Human Skeletal Remains” and White et al. (2011) in the “Human Bone Manual.” As these standardized cranial metrics measurements collected by physical anthropologists, metric data presented in this dissertation also served as a useful database because it is the only baseline data available from the YK cave of Amhara Region in Ethiopia, and therefore will aid in future comparative research. Cranial samples were not found in the AM or DS. The osteometric points were measured in centimeters with digital sliding calipers and spreading calipers.

The majority of the crania were complete, but some measurements could not be taken either because of pathology or trauma. Some of the crania were broken or fragmented. Fragmentary crania were measured using extant landmarks, and those features not observable were recorded as “Not Applicable.” A total of for 24 osteometric points, as outlined by Buikstra and Ubelaker (1994), were obtained with spreading calipers. A digital caliper was used to measure shorter distance and distance lacking cranial obstruction, while spreading calipers were used for longer distance and distance

with cranial obstruction. Throughout the study, measurements were performed in centimeters.

### **Nonmetric Variation Analysis**

Nonmetric variation caused due to epigenetics, discontinuous morphological traits or discrete traits are crucial indicators for ancestry estimation in a bioarchaeological and osteological analysis (White et al. 2011). These inheritable traits can then be useful in analyzing relatedness and biological distance. Cranial nonmetric traits of primary importance outlined by Buikstra and Ubelaker (1994) were investigated and described.

### **Data Analysis Software Tools**

#### **Fordisc 3**

Fordisc 3 is a computer software program used to enhance the ability of forensic experts and bioarchaeologists to assess the sex, ancestry and stature of adult cranial and postcranial elements. It utilizes data from the Forensic Anthropology Data Bank (ADB), universities, medical examiners and forensic agencies. This program estimates stature using linear regression. Regression analysis was used for the estimation process in a dynamic and individualized manner, then in the set, a static manner of a regression equation (Jantz and Ousley 2005; Ousley 2009).

#### **Statistical Package for the Social Sciences**

Statistical Package for the Social Sciences (SPSS) is a widely-used program for statistical analysis in social science research (Hilbe 2010). The software was used to obtain descriptive statistics based on the measurements taken from the mummies. It

was also used to document variation of preservation among different age, sex and status groups of mummies.

### **ArcView GIS**

Data collected from the cave churches were analyzed using ERDAS IMAGIN 8.6, ArcView GIS 10.1, Excel and Fordisc software programs. ERDAS IMAGIN 8.6 was used to import scanned topo sheets in image file format. Then, an imported image was georeferenced using ERDAS IMAGIN 8.6. Then the image was registered to the existing image file and exported to ArcView GIS 10.1 to generate a map of the study area. An AutoCAD was program is used to produce cave maps.

Data regarding mummies and mummification practices in selected sites were collected based on a form developed to accommodate a range of variables. These variables include status, sex, age, wrapping materials, pathology and trauma. The study included both well-preserved mummies and those in good condition. The analysis excluded partly buried, damaged, entangled and skeletonized remains.

### **Physical Anthropology Analysis**

A total of 221 mummies were documented from the AM, DS and YK cave monasteries. Of this total, 40% were documented from the YK in northern Ethiopia. The remaining 31% and 29% were from the AM and DS in central Ethiopia, respectively (Table 6-1 & Figure 6-1).

The highest concentration of mummies in Ethiopia was found in the YK. According to Abba Haile Mariam Haile Gabriele, more than 10,000 pilgrims have come to the monastery. Other priests claim that over 11,000 mummies might be present. These mummies were spiritually mummified individuals with little or no human intervention (Chapter 7).

## Social Status Determination

Determination of the social status of the mummies is one of the objectives of this dissertation (Robb 2001). Determination of status was based on the orientation of the hand, material buried with the deceased and burial distance from the center of the church. The orientation of the hand was based on the accepted tradition of the Ethiopian Orthodox Tewahdo Church. According to the church, the orientation of the deceased hand has reflected the status of the mummies since the foundation of the church in the fourth century. Status of the mummies was categorized into four groups: priests, monks, deacons and followers in the AM, DS and YK.

Identification of mummified priests was primarily based on the hand position and the arrangement of the fingers. As explained in detail in Chapters 7, the orientation of a priest's hands crisscrossed over the chest, a monk's and nun's hand was placed on/over the eye and ear, a deacon's hands were put on the shoulder parallel to each other, and followers' hands were placed on their genital organ.

Another method to determine status in mummies from the YK and AD monasteries was the analysis of their diets. Since only a limited sample for supplementary diet analyses exists to assist in status determination, documents in the Ge'ez script were consulted. These documents, known locally as *lifafetsidik*, were useful in providing biological profile data.

Priests possessed the highest social status, followed by monks, nuns, deacons, and lastly, followers. At 37%, followers represented the largest proportion of mummified remains (88 of the total of 221 mummies), followed by priests (25%) and deacons (10%). The 23 deacon mummies were also the youngest age group.

In the AM, followers represented the majority of mummies, at 71% (48 mummies), with monks contributing the lowest number, at only 4%. Priests were the highest number of mummies in the DS and YK, while deacons represented the smallest number (Table 6-2 and Figure 6-2).

As indicated above, data collected from the field were taken for further analysis to the University of Florida laboratories in USA and the University of Ottawa AMS laboratory in Canada. Radiocarbon dating analysis was done on teeth and skin. Isotope analysis of hair samples and teeth samples was also performed (Chapter 7).

### **Sex Determination**

Osteological standards and interpretation were used to determine the sex and age at death. Sex determination of the selected mummies and crania are based on metric and nonmetric variables indicated by Buikstra and Ubelaker (1994), White et al. (2011) and Bass (1995). Skulls were categorized into three groups: male, female and indeterminate. Most of the mummies are extremely well preserved and thus made sex determination easier. Sexing mummies was based on macroscopic examination, consulting inscribed documents and multiple morphological attributes. Standardized non-metric traits include mental eminence, gonial angle, gonial eversion and general robusticity. In addition, male mandibles are distinguishable based on squarer chin, larger areas for muscle attachments, ramal flexion and deeper rami (Table 6-3). Finally, the *Ge'ez* scripts buried with mummies were useful to determine accurately.

Sex determination of mummies and skeletal remains found in the AM, DS and YK is crucial because a predominance of male or female mummies could reveal a gendered preference for social status, social roles and burial practices. The proportion of sex, therefore, could contribute to enhancing knowledge regarding the mortuary

function of the AM, DS and YK. Evidences from the mummies, such as the presence of breast and genital organs, were also taken into consideration. The estimated sex was also crosschecked to the short biography inscribed on the leather sheet using the Ge'ez language.

The majority of the documented mummies were male. Of the total of 221 mummies, 71% (157) were male and 29% (64) were female (Table 6-4 & Figure 6-4). The overall distribution of sex across the study sites shows similar results. Of the total of 88 mummies at YK, 80% (70) were males and the remaining 30% (18) were females. Similar results were found for the AM and DS sites, where males represented more than 60% of the total mummies at each location (Figure 6-5).

### **Age Estimation**

One of the fundamental objectives of forensic anthropologists is to determine a chronological age at death (Stull and James 2010). Age estimation is based on the study of the biological variations that take place throughout life and could offer pieces of evidence regarding age at death (White et al. 2011). Bone is a living tissue that remodels and modifies throughout a human lifespan, reacting to hormones, trauma and pathological conditions. Forensic anthropologists use gross morphological aging standards that are simple to apply, do not demand highly specialized equipment and are non-destructive.

Age of a mummified human body was made based on the macroscopic physical examination of the mummy's morphology (Masters 1978), teeth eruptions, fusion stages, levels of dental attrition and degenerative alteration to the *bones* (Bass 1995, p.,12). The excellent condition of the selected mummies provided an ideal opportunity to accurately determine accurately the age of the deceased. *Lifafetsidik*, written in the

Ge'ez language, was also deciphered and used to ascertain the age of the individuals. The status of a mummy was also consulted to estimate the age of priests, deacons and nuns.

Standardized methods of morphological traits outlined by White et al. (2011) and Buikstra and Ubelaker (1994) were also utilized to estimate age at death. The cranial suture closure method of estimating age was employed particularly on the infant and child mummies. Teeth are also another important way of determining age at death. Milk teeth, unlike permanent teeth, are necessary to estimate the ages of mummified remains. Age estimation from mummies and cranial remains were generalized into seven classes.

However, this study used the approach of seriation to avoid imprecision of age determination. The mummies in the study sites were arranged in a sequence of increasing age. The most important age classes included in this study were infant (birth to three years old), child (3 to 12 years), young adult (20 to 35 years), middle adult (35 to 50 years), and old adult (50+ years) (Table 6-5) (White et al. 2011). In this study, the developmental stage was used rather than a specific number. Thus, a range is always given when estimating age to increase the degree of accuracy rather than a specific number of years. Ages of the selected mummies were calculated partly based on observations of external suture closures. These sites were scored as 0 for open, 1 for minimal closure, 2 for significant closure, and 3 for completely obliterated/closed. There are debates over the drawbacks of aging based on cranial suture closures (Ginter 2005). However, the weaknesses of age estimation in mummies and in cranial remains

from the mummies were supplemented using teeth, text documents and physical appearance.

Age determination was based on age group rather than a specific year. Accordingly, White et al. (2010) identify age groups based on developmental stage. Social status - recorded in the *Ge'ez* text - and non-metric analysis provided crucial information about age estimation at death in the study sites. Of the total of 221 mummies, 47% (107) were from the life developmental stage of middle-aged adults, while only 2% (5) were identified as children between 3 and 12 years old (Table 6-6 & ) Similar result were recorded across sites (Table 6-7).

Taphonomic conditions - such as bone discoloration, weathering, corrosion and cut marks on mummified and skull remains - were also recorded in the AM, DS and YK. Minimal postmortem damage to the remains and no evidence of gnawing or animal activity were recorded. The general taphonomic characteristics of the elements reveal a broad range of variation. Although the mummies and skeletal materials were extremely well preserved, they varied significantly in their coloration, texture and condition. The variation in the state of the mummies and skeletal remains might provide insight into the different positions within the mortuary deposit (Chapter 8).

### **Paleopathology**

Paleopathology is the study of past human disease and abnormalities. Infectious disease such as leprosy was well documented in ancient Egypt. Moller-Christensen (1966) reported early cases of leprosy from Nubia. In this study, evidence of leprosy was also documented in the AM (Chapter 8).

### **Cranial Analysis using Fordisc 3.1**

Fordisc 3 utilizes data from the Forensic Anthropology Data Bank (ADB), universities, medical examiners and forensic agencies. This program estimates stature using linear regression. Regression analysis was used for the estimation process in a dynamic and individualized manner, then in the set, a static manner of a regression equation (Jantz and Ousley 2005; Ousley 2009). The application of Fordisc has become a subject of academic debate (Belcher & Armelagos 2005; Fried et al. 2005, Hubbe & Neves 2007, Keita 2007; Leathers et al. 2002, Naar et al. 2006; Ubelaker et al. 2002)

Determining a biological profile from human remains is baseline work for bioarchaeologists and forensic anthropologists. The biological profile composed of an estimation of an individual's sex, age, ancestry and stature. Anthropologists exploit computer programs to manage extensive data and increase the reliability of the results. Fordisc is a discriminate-function computer program used to estimate the aforementioned variables (Jantz and Ousley, 2005).

In Fordisc 3, an indeterminate crania is ascribed a population affinity by identifying the closest Mahalanobis distance from the unknown to the mean vector scores for each undetermined. Moreover, Fordisc 3 analyzes the typicality and posterior probabilities, where a skull is classified to a specific group (Jantz, 2008). According to Ousley and Jantz (2005), posterior probabilities classify the likelihood that a given skull belongs to one or more particular groups.

A cranium is a crucial part of human bone that provides a wide range of information regarding age, sex and ancestry; and enables osteologists and paleoanthropologists to understand human evolution (White and Folkens 2010).

Statistical methods were used to show the results. The attributes used for statistical analysis are sex and ancestry determinations. The craniofacial measurements of a total of 59 skulls were collected as outlined by Buikstra and Ubelaker (1994). I took 18 cranial measurement points from each selected skull in the Yemerhane Kirstos cave church. The osteometric points include: glabella to opisthocranium, maximum cranial breadth, bizygomatic breadth (distance between the most lateral points of the zygomatic arches), basion to bregma, nasion to basion, basion to prosthion, prosthion to alveolon, minimum frontal breadth (distance between the two frontotemporale), nasion to nasopinale, nasal breadth (maximum breadth of the nasal aperture), dacryon to ectoconchion, and orbital height (distance between the superior and inferior orbital margins). The skull measurements were excluded at the time of lab analysis, after comparing them with Forensic Data Bank measurements. Exclusion of the skulls was mainly due to pathological deformity, growth abnormality or cranial modification. Of the original 59 adult crania available, 14 were missing important measurements due to poor preservation. As a result, only 45 crania were analyzed using Fordisc 3.

Numerous of skulls were found in the YK monastery. Complete adult crania on which a majority of standardized measurements and observations could be recorded were included in this study. Position and physical state are the prime variables used to determine the inclusion or exclusion of the skulls. Another determinant for inclusion was the physical nature of the skull, which refers to whether the skull is damaged or undamaged, attached or unattached to the body, and covered with muscle tissues. In line with this, eight of the osteometric measurements, such as Bizygomatic Breadth, Maxillo-Alveolar Length, Biauricular Breadth, Orbital Breadth, Frontal Chord, Occipital

Chord, Parietal Chord and Interorbital Breadth, were excluded. The exclusion of the osteometric points were mainly due to measurements potential impact to alter the Fordisc result.

A total of 45 sets of craniometrical data were collected from the YK cave church. All measurements were recorded into an Excel spreadsheet (Microsoft 2013). The Excel spreadsheet data were sent to CA Pound Lab at the University of Florida for statistical analysis using the Fordisc 3.1. Each cranial measurement was evaluated independently using the Fordisc 3.1 data bank and Howell's data bank to estimate sex and ancestry. The Fordisc data are more relevant for the modern population than ancient populations, while Howell's archaeological data from different periods before the twentieth century are more appropriate for cranial morphometric collected from the YK cave monastery.

The Fordisc 3.1 data classify thirteen of the crania as Japanese, eleven of the crania as African American, ten crania as white European, six of the crania as indeterminate, two crania each as Hispanic and African and the reminder one as Vietnamese (Table 6-9 & Figure 6-7) (Chapter 8).

### **Summary**

A total of 221 mummified human remains were documented and included in this study. Unfortunately, the majority (209) was recorded from a secondary depositional location. A total of 13 undisturbed mummies were excavated in the DS. The DSRC facilitated the excavation permit because the church was under renovation. Proper archaeological procedures were followed to exhume corpses from the burial graves. Mummies of a child and a woman were uncovered in Locality I. Surprisingly, in Locality III, multiple interments of four men and a woman were discovered. Wrapping materials

were the same for all, and no grave goods were discovered, a typical characteristic of Christian burial in Ethiopia.

Even though the cave of the AM was similarly under renovation at the time of the visit, a church official declined to give permission to excavate the burial graves. As a result, mummies found in secondary deposits were documented.

The majority of mummies (133) were collected from central Ethiopia, with the remainder (88) coming from the northern part of the country. The religious group – composed of priests, monks, nuns and deacons – represented 63% (141), while followers amounted to 27% (80) of the total corpses. Unsurprisingly, the total number of men is three times higher than women, possibly indicating the patriarchal society, where men controlled more of the resources. The proportion may also indicate that men traveled a longer distance than women to reach to this highly inaccessible monastery. According to the oral tradition in the YK, the majority of the mummies were from Egypt, Syria and Asia Minor.

Table 6-1. Distribution of mummies in the study sites.

Archaeological Site name	Number of mummies	Percent
YK	88	40
AM	68	31
DS	65	29
Total	221	100

Table 6-2. Total distribution of status in the AM, DS and YK sites.

Mummies Status	Number of mummies	Percent
Priests	55	25
Monks	23	10
Deacons	32	14
Nuns	31	14
Followers	80	36
Total	221	100

Table 6-3. The characters of the male and female skulls used for sex determination.

No	Defining cranial features	Male	Female
1	Supraorbital ridges	Prominent	Less prominent
2	Frontal sinuses	Larger	Smaller
3	Superior Orbit	Blunter	Sharper
4	Muscle ridges	Prominent	Less prominent
5	Frontal bone	Sloped	More upright
6	Zygomatic process	Yes	No
7	Mastoid process	Larger	Smaller
8	Anterior Mandible	Square	Pointed

Table 6-4. Comparative distribution of status in the AM, DS and YK sites.

Mummy Status	AM	DS	YK	Mummy Status	AM	DS
	No	Percent	No		No	Percent
Followers	48	71	13	Followers	48	71
Priests	6	9	19	Priests	6	9
Deacons	5	7	6	Deacons	5	7
Monks	3	4	11	Monks	3	4
Nuns	6	9	12	Nuns	6	9

Table 6-5. The developmental stage of age classification (White & Folkens 2005)

No	Age class	Age group
1	Fetus	Before birth
2	Infants	0-3 years
3	Child	3-12 years
4	Adolescent	12-20 years
5	Young Adult	20-35 years
6	Middle Adult	35-50 years
7	Old Adult	More than 50 years

Table 6-6. Sex distribution in the study sites.

Sex Distribution	Mummies	Percent
Male	157	71
Female	64	29
Total	221	100

Table 6-7. Sex distribution of mummies in each study sites.

Archaeological site Name	Male	Percent	Female	Percent
YK	70	80	18	20
AM	42	62	26	38
DS	45	69	20	31
Total	157		64	

Table 6-8. The distribution of age in the study sites.

Age class	Age	Mummies	Percent
Fetus	Before birth	0	0
Infants	0-3 years	12	5
Child	3-12 years	5	2
Adolescent	12-20 years	23	10
Young Adult	20-35 years	15	7
Middle Adult	35-50 years	104	47
Old Adult	More than 50 years	62	28

Table 6-9. Fordisc 3.1 Results Using Howells's Cranial Data.

ID	Sex	Group	Mahlatobi Distance	Posterior	Typicality probability
1	Male	DOGM	74.7	0.895	0.021
2	Male	DOGM	77.9	0.983	0.021
3	Male	BF20	44.6	0.918	0.014
4	Male	DOGM	123.2	0.947	0.021
5	Male	WM20	60.9	0.364	0.003
6	Male	WM20	64.2	0.434	0.003
7	Male	EGYM	105.1	0.42	0.017
8	Male	WM20	141.3	0.531	0.003
9	Indeterminate	The classification of current case is Multigroup			
10	Female	ZULF	130.6	0.938	0.021
11	Female	BF20	115.2	0.826	0.014
12		The classification of current case is Multigroup			
13	Male	DOGM	67.5	0.637	0.021
14	Female	WF20	50	0.217	0.006
15	Male	DOGM	97.6	0.472	0.021
16	Female	WF20	99.6	0.386	0.006
17	Male	BF20	58.3	0.542	0.014
18	Male	DOGM	85.6	0.99	0.021
19	Male	BM20	81.4	0.489	0.01
20	Male	DOGM	89.9	0.907	0.021
21	Indeterminate	The classification of current case is Multigroup			
22	Female	DOGF	124	0.485	0.019
23	Female	DOGF	155.9	0.979	0.019
24	Female	BF20	110.6	0.804	0.014
25	Male	DOGM	143.4	0.979	0.021
26	Female	BF20	71	0.677	0.014
27	Male	DOGM	161	0.669	0.021
28	Male	DOGM	65.2	0.971	0.021
29	Female	BUSF	38.1	0.45	0.02
30	Male	DOGM	84	0.989	0.021
31	Indeterminate	The classification of current case is Multigroup			
32	Female	WF20	56.7	0.433	0.006
33	Male	DOGM	118.1	0.959	0.021
34	Male	DOGM	93.4	0.989	0.021
35	Male	DOGM	74.3	1	0.021
36	Female	TEIF	82.4	0.464	0.02
37	Indeterminate	The classification of current case is Multigroup			
38	Male	DOGM	127.5	0.971	0.021
39	Male	ZULM	104.5	0.828	0.018
40	Male	DOGM	101.3	0.977	0.021
41	Female	BUSF	82.6	0.991	0.02
42	Male	DOGM	68	0.975	0.021
43	Indeterminate	The classification of current case is Multigroup			
44	Male	EGYM	88.9	0.547	0.017
45	Indeterminate	The classification of current case is Multigroup			

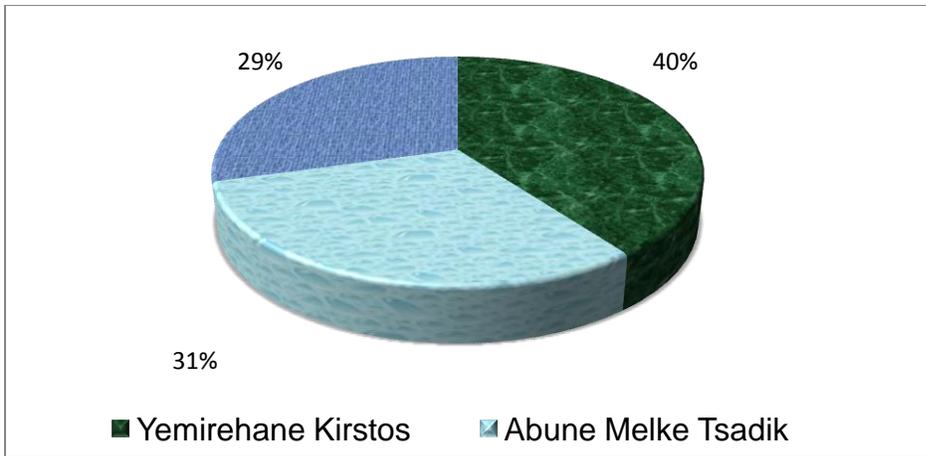


Figure 6-1. Distributions of documented mummies form the YK, AM, and DS sites.

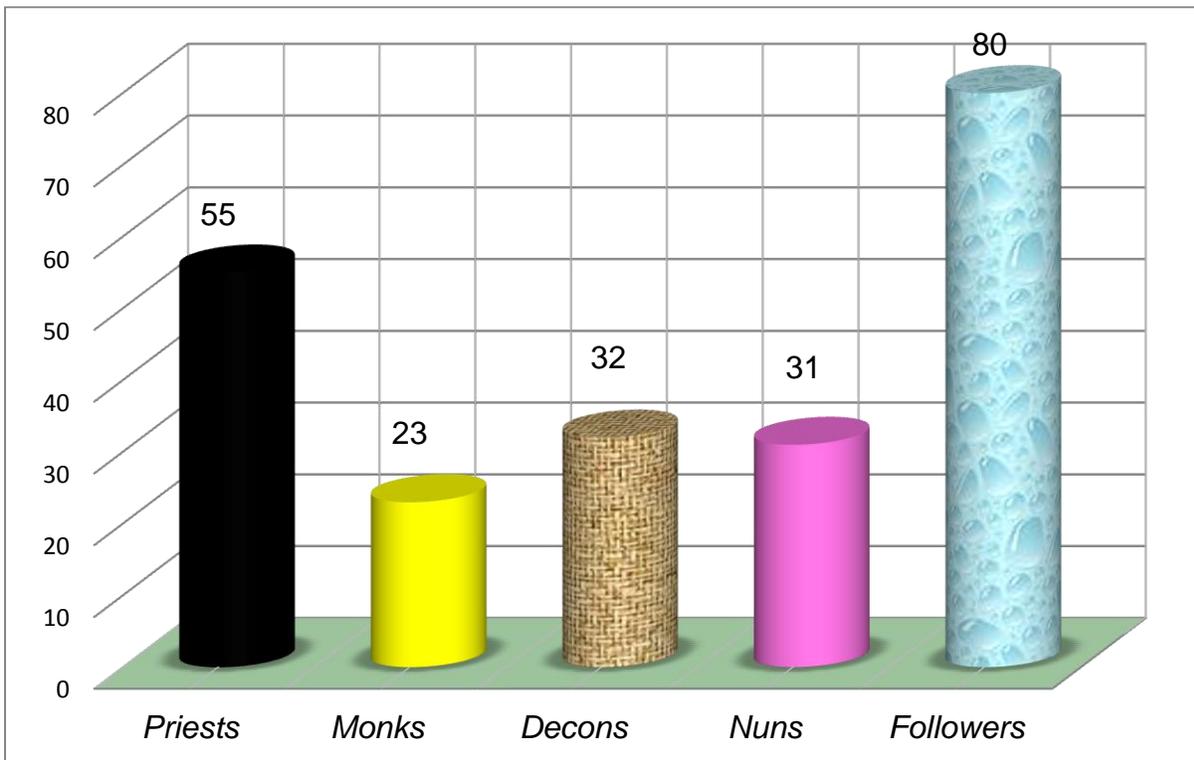


Figure 6-2. Status distribution of mummies in the study sites.

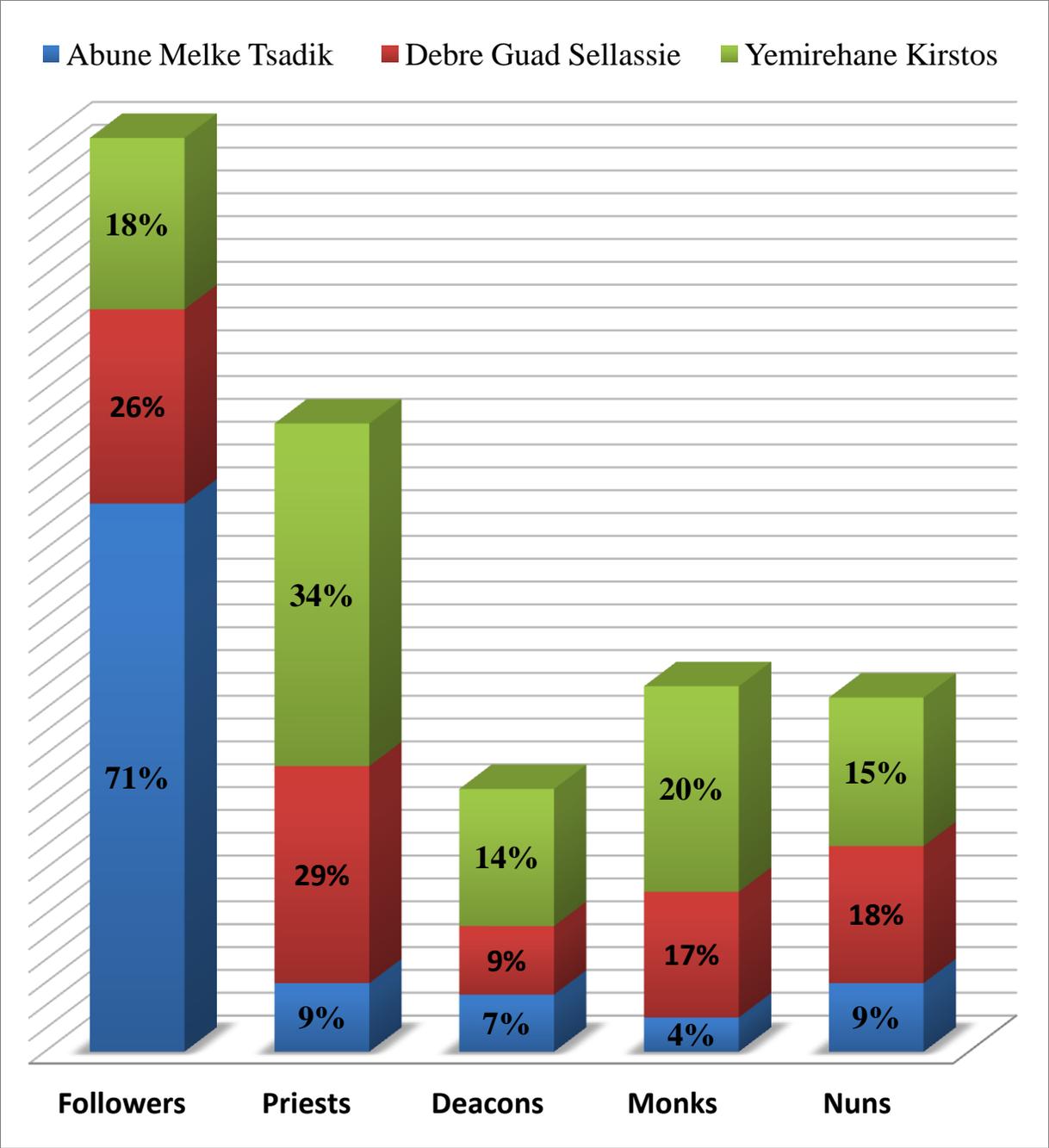


Figure 6-3. Status distribution of mummies in each study sites.

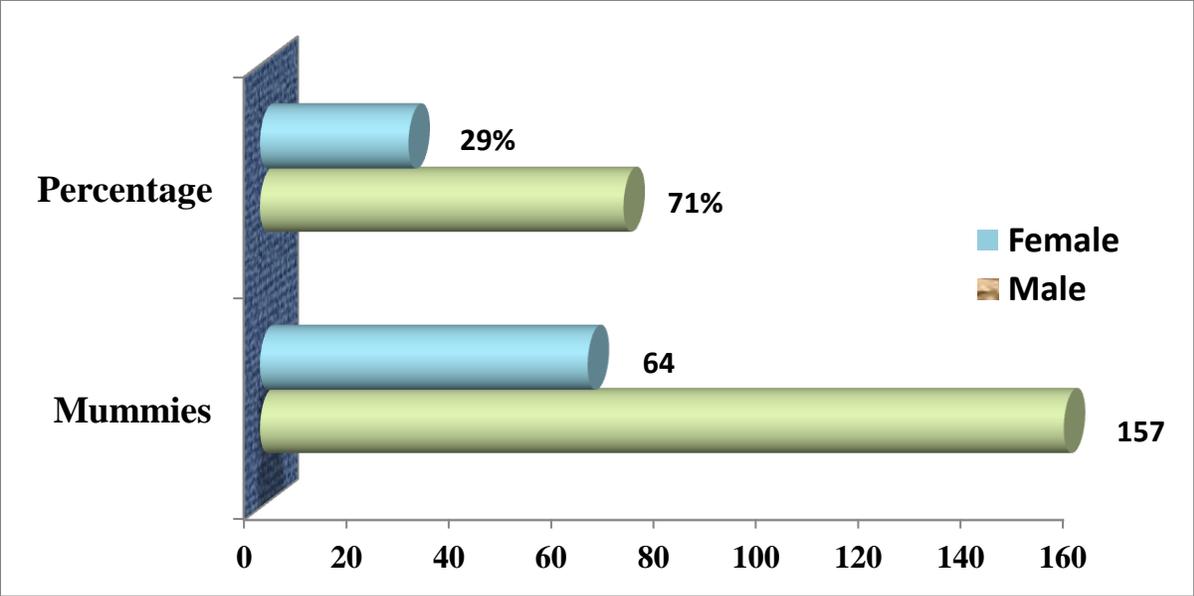


Figure 6-4. Sex distribution in all sites.

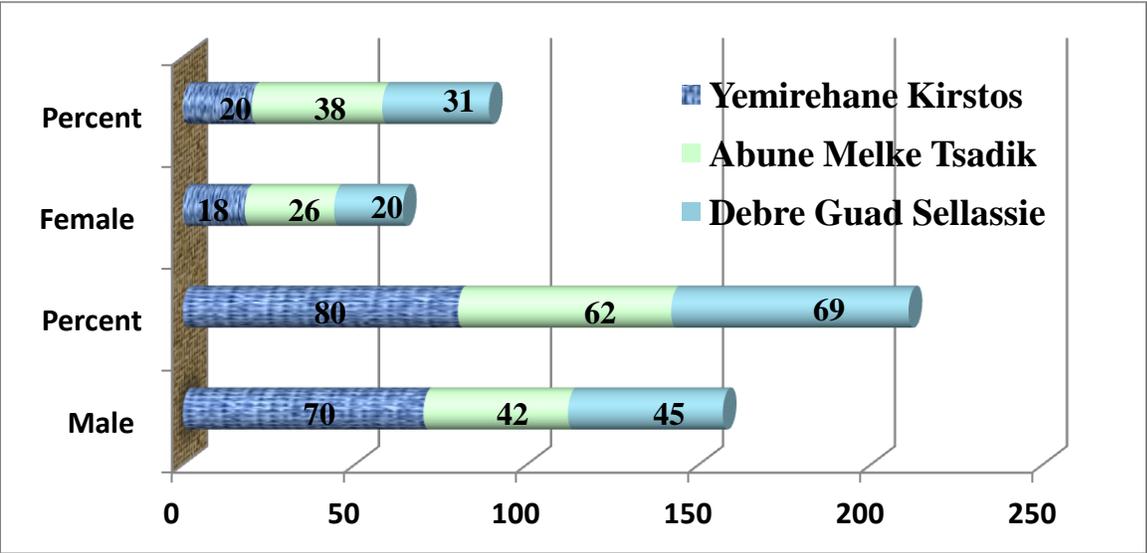


Figure 6-5. Sex distribution of mummies in each study sites.

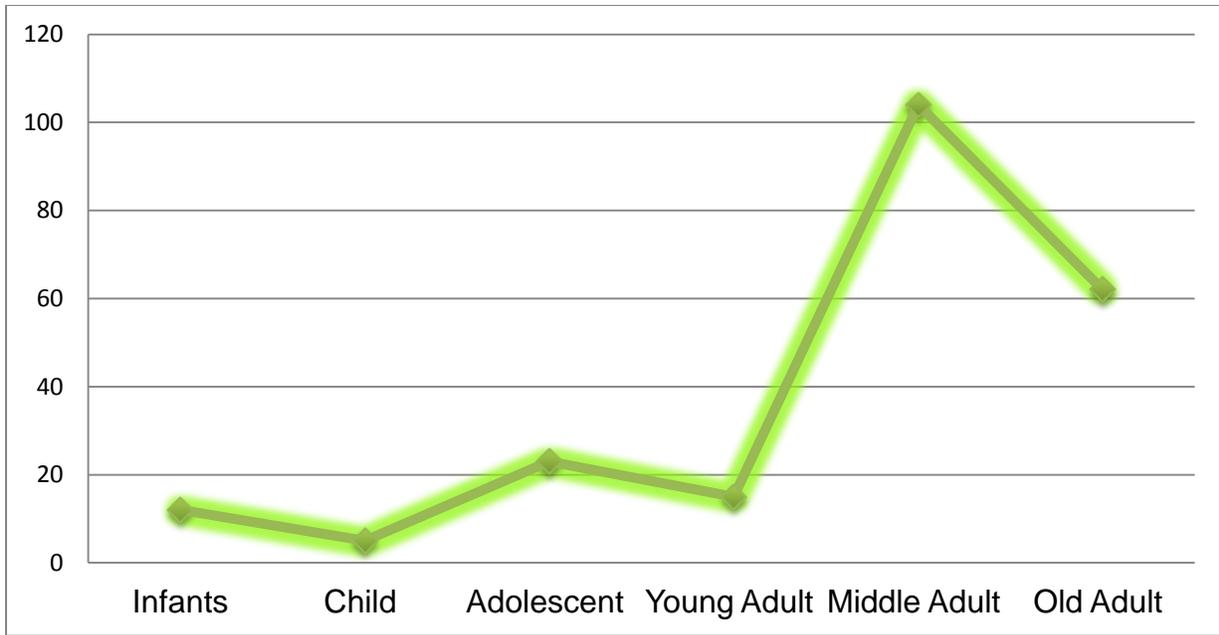
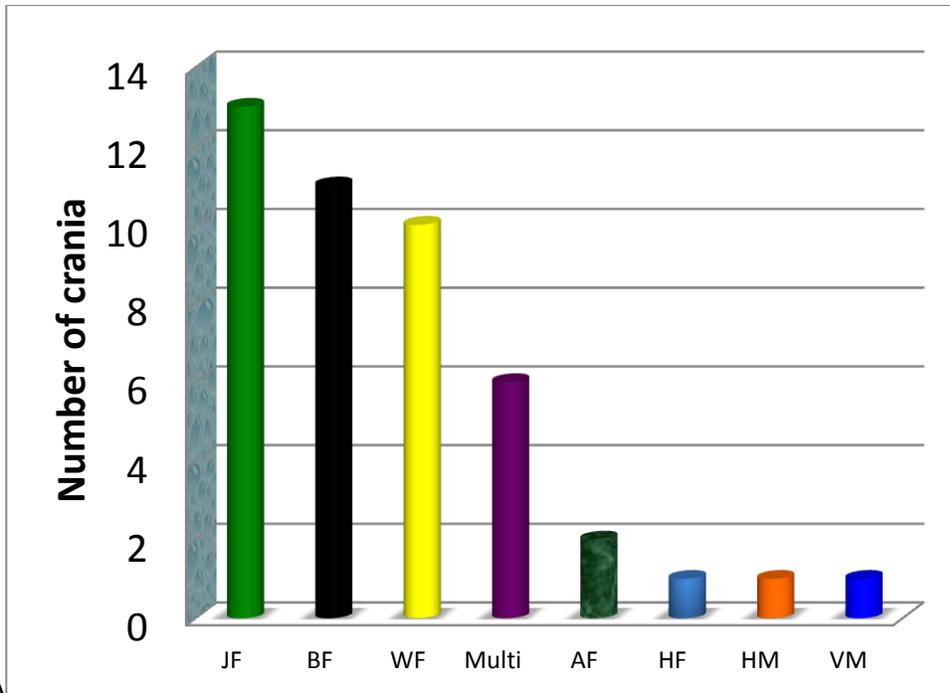
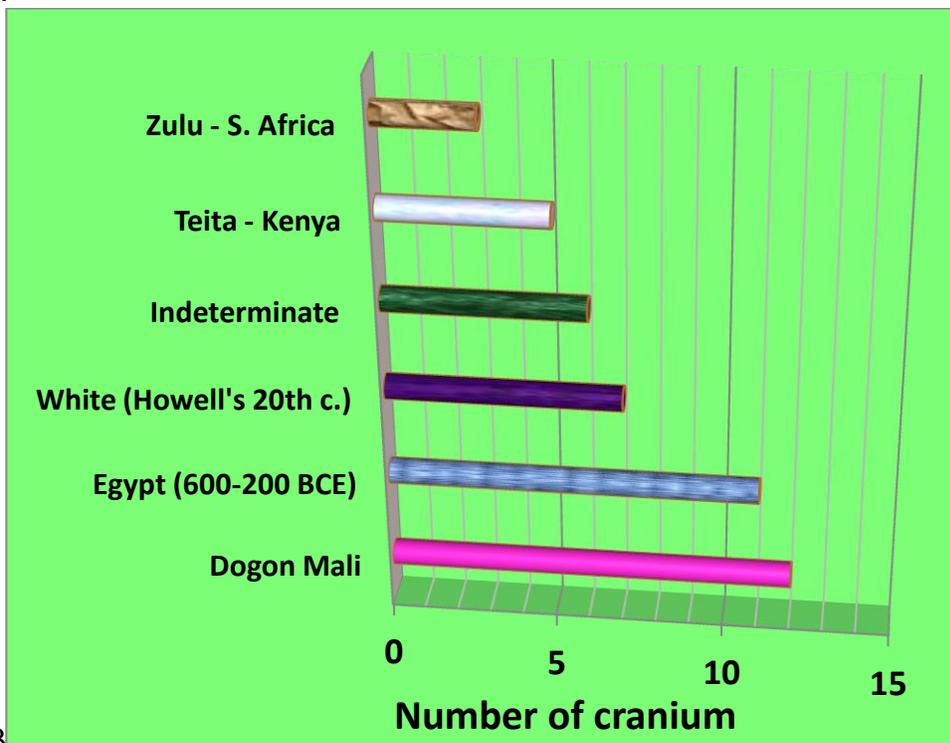


Figure 6-6. Age class distribution of mummies from the study sites.



A



B

Figure 6-7 Fordisc 3.1 results A) a result when using Howells cranial data. B) After excluding the unlikely candidate Howells's cranial data.

## CHAPTER 7 ANALYSIS OF ARCHAEOLOGICAL FINDS AND MUMMIES FROM THE DS, AM AND YK SITES

In Chapter 7, a detailed analysis of archaeological finds, such as altar tables, crosses, parched texts, and wrapping materials is presented. Mummies discovered with crosses, trauma and pathology are presented in a greater detail. The Chapter further explains lab analysis of Fordisc, carbon 14 and isotope.

### **Archaeological Findings**

Most of the mummified remains were removed from their original burial ground and stacked in a secondary deposition area located at the back of the cave monastery. The removal and subsequent relocation of mummies were mainly due to renovations of the DS, AM and YK sites. Archaeological finds uncovered during restoration and excavation processes include altar tables, crosses, mummified remains, *Lifafetsidik* and burial coffins.

### **Altar Tables, Ge'ez Scripts and Monographs**

Altar Tables or Holy Tables, engraved with the Ten Commandments, were recovered by the DSRC during expansions of the DS, AM and YK monasteries. However, there was no proper documentation of the finds at the time of renovations to the church. Attempts to get a picture of the tablets were unsuccessful, as they are sacred materials. The altars are always kept in a restricted place and only the priests and deacons in respective monasteries (the YK, AM and DS) have access to these religious materials. Followers or visitors are not permitted to see the Holy Table. According to local tradition, the altars uncovered from each site were buried during the Ahmed Gagn War (1520-1543) (Chapter 8).

*Lifafetsidik* was a Ge'ez script written on a well-tanned skin. To create a *Lifafetsidik*, an animal skin was tanned to arrest decomposition and thereby prolong the durability of the Ge'ez script. The Genizah (embalmer) would create a *Lifafetsidik* by writing a short biography of the individual in Ge'ez on an animal skin and then saying a prayer. The prayer recited after the person's death was believed to help in the person's spiritual journey to afterlife transformation. *Lifafetsidik* was a description of the righteousness of the individual and was an important document because it helped to determine the age, sex and status of the mummies. For example, words such as *Leametike* (female servant of God) were used for women and *Legeberke* (male servant of God) were used for men. These words assisted the process of sex identification. *Lifafetsidik* scripts were discovered in all the sites and had similar meanings across sites.

### **Crosses Associated with Mummies**

Multiple and diverse crosses were recovered during restorations of the DS, AM and YK cave monasteries. The iron crosses were material evidence used by the priests who lived in these monasteries. However, most of the crosses were found in the AM site (Table 7-1).

A total of ten crosses were found in-situ, on mummies, but removed from their primary interments. The crosses were composed of stone, wood and leather. Wooden rectangular crosses were found more commonly than those made of iron and leather in the AM cave monastery. Initially, I arranged the crosses based on their composition to determine style and typology to identify contemporaneity of among mummies. However, a contextual explanation of the crosses by Deacon Yibzawork Mesfin Abebe shed more light. According to the deacon, the stone, wood and leather cross symbolized the

sufferings of Jesus Christ. For example, the wooden cross is believed to have symbolized the crucifixion on the wooden cross. Hence, followers carry such crosses in remembrance of the pain Jesus sustained to refrain from sin.

**Circular cross AMC1 on AMP2.** The most compelling material evidence still attached to AMP2 in the AM monastery was the intact circular cross and cord (Figure 7-1). AMC1 was 6 cm tall. A cross-shaped symbol was engraved on the circular wooden cross (Figure 7-2). The forms and designs of crosses vary in time and space. The meaning of the geometric representations of each square is unknown. According to interviews with elders, these forms and designs are no longer used.

AM2 was removed from its original burial location for renovations and stacked in a corrugated room inside the cave. The length and width of AMP2 were 16 cm by 72 cm. AMP2 was estimated to be a middle-aged adult based on information from a religious text, the condition of the teeth and the status of the mummy. Accurate determination of sex was based on the presence of the male sexual organ.

A locally made cotton sheet and a palm mat were used to wrap the mummy. The exterior wrapping, palm mat and the majority of the interior cotton wrapping were mostly damaged either during excavation or deposition of the mummy. Small portions of cotton sheets and palm mat were uncovered. Although most of the wrapping materials were damaged, AMP2 was intact and found in an excellent condition. The lack of hair with AMP2 might suggest that he was shaved during the preparation of the body. Nevertheless, determination of the hair condition was somewhat difficult because there was still material attached to the head providing mitigating evidence of postmortem hair loss due to decomposition.

AMP2 was classified as a priest because both hands crisscrossed each other, a key factor for the identification of a priest. The cranial part of AMP2 was facing toward the right, perhaps due to postmortem impact. The leg was twisted. The twisting might have been due to damage to the sciatic nerve from prolonged periods of standing for prayer (Chapter 8).

**Anthropomorphic shaped cross AMC2 on AMP3.** A large anthropomorphic shaped cross was buried with AMP3 (Figure 7-3). AMC2 was 25 cm tall (Figure 7-4). According to the treasurer of the AM monastery, this kind of cross is no longer used by priests. AMC2 was used to bless the followers who came to the cave monastery. It is customary for the local people to ask for and receive sanctification from a priest. Hence, priests carry crosses wherever they go and willingly offer sanctification. As a result, it is very common to uncover a cross with a priest burial.

AMP3 was standing in an erect position inside the corrugated room of the cave and was the tallest of the six mummies. The bundle measured 175 cm long and 70 cm wide. This individual was interred with a text, but the Ge'ez text buried with the priest was partly damaged. The remainder the text was informative about the age of AMP3. He was estimated to be a middle-aged adult based on the *Lifafetsidik*. The sex of AMP3 was easy to identify as the male genital organ was preserved. Macroscopic evaluation of the teeth of AMP3 revealed that most of the upper incisors were lost. This was attributed mostly to age-related factors coupled with poor oral hygiene.

The hands were positioned in a crisscrossed position over the chest, a typical mortuary practice for a priest in the EOC for the position of the hands. Although the cotton sheet that wrapped AMP3 was mostly decomposed, a piece of it survived. The

palm mat was lost during excavation and deposition of the mummy occurred from renovations efforts. However, a print of the palm mat was found on the cotton sheet that covered the leg of AMP3.

**Anthropomorphic shaped cross AMC3 on AMP4.** An anthropomorphic shaped cross was discovered on AMP4 (Figure 7-5). AMC3 was 10 cm long and engraved with geometrically shaped lines mostly rectangular and triangle (Figure 7-6). The meaning of the geometric engraving is unknown. According to a local priest and elders, anthropomorphic shaped crosses are no longer in use.

AMP4 was standing in an erect position in the storage room (Figure 7-5). The wrapping materials were partly damaged and partially preserved. AMP4 was wrapped with a cotton sheet and was tethered using cotton cords. The entire palm mat, similar to AMP3, was uncovered, but the imprinted marks of the mat were visible on the cotton sheet. This indicates that AMP3 was wrapped in a palm mat.

The bundle measured 175 cm by 81 cm. The hands of AMP4 were below the shoulder slightly on the chest most possibly due to post mortem impact. Nevertheless, the hands crisscrossed each other indicating that the mummy was a priest. AMP4 was estimated to be more than 50 years old. The age determination was inferred from tooth loss, status and general visual examination. Natural tooth loss is an important indicator of age. According to local elders, tooth loss often starts in the early fifties.

The head of the mummy faced toward the left probably due to postmortem impact (Figure 7-5). The face was defleshed, and the teeth were exposed most likely due to macro and microorganism feeding. Some of the right side teeth were lost,

perhaps due to age and health factors. Nonetheless, no significant antemortem trauma, injury, or pathological conditions were recorded.

**Rectangular shaped cross AMC4 on AMP5.** A small rectangular wooden cross was buried with the AMP5 (Figure 7-7), which may have been contemporaneous with AMC5, AMC6, AMC7 and AMC9 (Figure 7-8). However, further analyses would be required to determine the age of the crosses.

AMP5 is similar to the AMP2, AMP3 and AMP4 mummies; the hands were crisscrossed on the chest, an indication of his ecclesiastical authority as a priest. The height of the bundle was 164 cm, and its maximum width was 70 cm. AMP5 was a male priest based on the preserved genitals and the status, and was a middle-aged adult. The body had been wrapped in a cotton sheet and animal hides. The cotton cloth that covered the face and chest was damaged. Fortunately, pieces of the hides and cotton cloth were preserved.

**Rectangular shaped cross AMC5 on AMD1.** A rectangular shaped cross (AMC5) was discovered on AMD1 (Figure 7-9). AMC5 was 6 cm by 4 cm. The cross was tethered around the neck of AMD1 and was well preserved (Figure 7-10). A crescent shaped engraving ran from the center to the four corners. The meaning or the symbolic representation requires further archaeological research.

AMD1 was found in an erect position inside the cave monastery (Figure 7-9). It was wrapped with a cotton sheet and a palm mat. Most of the materials buried with AMD1 had decomposed. However, parts of the palm mat and *gabi* (cotton sheet) still attached to the postcranial body part. The length and width of the mummy were 165 cm by 70 cm.

The hand was placed over the shoulder, representing the functional title of a deacon. The ecclesiastical title of deacon is given only to men. The orientation of the hands (fingers) are more important in determining whether AMD2 was a priest, deacon, a monk or a nun than any other body part. The finger arrangement and placement on the shoulder clearly demonstrated that AMD1 was a deacon. Based on the EOC traditional customary law, my physical observations, the report of the locals and a religious text, AMD1 was determined to be a young adult. *Lifafetsidik* and cross were material artifacts recovered with AMD1, but it is rarely possible to obtain the time of death from a *Lifafetsidik*. AMD1 revealed no trauma or pathological conditions. The cause of death was unknown.

**Rectangular shaped cross AMC6 on AMM1.** A rectangular cross was attached to the body using a cotton cord (Figure 7-11). The size of AMC6 is similar to AMC5 (6 cm by 4 cm) (Figure 7-12). AMM1 was discovered in an erect position in the storage section of the cave and was wrapped with a *gabi* and palm mat. Even though it was tethered with a cotton rope, its state of preservation was excellent. The cotton trade rope used to tether the palm carpet was still intact and was not affected by decomposition. A wrapped cotton sheet was glued to the body but the adhesive materials used in the wrapping could not be identified.

The bundle of AMM1 measured 173 cm high by 85 cm wide. The estimated age class of AMM1 was an older adult based on social status, physical examination and religious text. It was not possible to see any trauma or pathological condition on AMM1. The cotton sheet wrapped around AMM1 completely covered the mummy. Because of this complete wrapping, the monastery supervisory committee did not allow untethering

and unwrapping of the cotton sheet for further visual examination. Even though the *gabi* completely covered the body, the position of AMM1 provides a clue to the status of the mummy. Corpse identification relied on the relative arrangement of the hand and placement of the fingers on the eyes or ears, the Ge'ez text attached to AMM1 and knowledge of local monks, priests and elders.

A small wooden cross and *Lifafetidik* found on AMM1 were still intact and attached to the body. The wooden cross is rectangular in shape and tethered to the middle part of the mummy. A local priest, who explained that the texts were religious in content, deciphered the *Lifafetsidik* text about the life of AMM1.

**Circular cross AMC7 on AMM2.** AMC7 was discovered on AMM2 (Figure 7-13). The cross was tethered using a leather cord. AMC7 is similar to AMC1 on AMP2, which showed contemporaneity between the two mummies. This kind of circularly designed and uniquely engraved cross is not currently in use. Most of the designs are unfamiliar to the local priests and monks in the cave monastery (Figure 7-14).

AMM2 was uncovered in a standing position inside the temporary storage facility at the back of the cave monastery. Preservation of the mummy was intentional. AMM2 wrapped with a *gabi* that displayed a remarkable degree of preservation. The mummy's appearance is impressive. However, most of the information regarding AMM2 was destroyed during the renovation process.

The bundle height was 175 cm with a maximum width of 69 cm. Based on macroscopic examination and information from local elders, the mummy was estimated to be a middle-aged adult. Initially, AMM2 was misdiagnosed as a priest because his hands partly crisscrossed each other. Later, reevaluation of the arrangement of the

fingers and the absolute position of each side of the hand exhibited confirmation of AMM2 as a monk. The sex of AMM2 was determined based on the presence of the male genital organ.

Evidence of pathological conditions was observed on AMM2. A facial feature of AMM2 was unusual compared to other mummies. Unlike other mummies, the mouth was unusually wide open. The teeth displayed significant decay. No sign of injuries or insect damage was detected on the mummy. The circumstance surrounding AMM2's death is unknown. Natural causes were most likely responsible for his death, as there was no significant evidence for pathology or trauma. X-Ray scanning would reveal more information, but unfortunately, an X-Ray machine is very difficult to find in Ethiopia. Only a few portable X-Ray machines are located in the country. An attempt to secure a mobile X-Ray device from Black Lion Hospital in Addis Ababa was unsuccessful.

**Rectangular stone cross AMC8 on AMN2.** AMC8 was a small rectangular stone cross buried and recovered with AMN2 (Figure 7-15). The cross is tethered to the neck of AMN2. However, the hanger was untethered and barely holding the cross (Figure 7-16). The fresh cut at the tip of the leather cord indicates that it occurred during the process of renovations.

AMN2 was found in an erect position inside the corrugated room depository. AMN2 was carefully taken out for visual observation and documentation. The cotton sheet and the palm mat used to wrap AMN2 were decomposed. Only a small portion of the cotton sheet and markings of the palm mat survived as evidence. The lack of proper preservation of the wrappings affects the integrity of the mummy. Moreover, the mummified body had started to disintegrate as it was moved from place to place for the

expansion of the cave monastery. The bundle height measurement was 152 cm with a width of 59 cm. The age of AMN2 was estimated between 50 and 60 years old. The status and identity of the mummy, based on the orientation of the hand, was determined to be a nun.

*Lifafetidik* was found on AMN2. It was one of the most important pieces of text providing a clue to the life of AMN2. Although the script was partly damaged, Deacon Yibzawork Mesfin, a minister at the local monastery, deciphered it. Most of the texts are religious biographies of the deceased individual and contain valuable information about their age, status and sex. They provide information regarding the sex, name and status of the person. The script also reveals some of the traditional beliefs that contradict the Orthodox belief system.

**Anthropomorphic shaped leather cross AMC9 on AMN3.** AMC9 is an anthropomorphic shaped leather cross that was uncovered with AMN3. It was tethered with leather cord. However, the hanger on the neck of AMN3 was untethered, and material evidence associated with it was lost. The symbolic representation of the crosses was similar to all sites, such as the YK, AM and DS. Specifically, the Coptic Church in Egypt and the Christian Church in Nubia used crosses similar to those used by the Eastern Orthodox Church where there is a resemblance between the crosses ( Figure 7-17 & Figure 7-18).

AMN3 was discovered in an erect position at the depository in the cave and was wrapped in a cotton sheet and a palm mat. Most of the wrapping materials were destroyed due to human intervention. Fortunately, AMN3's soft tissue was well preserved. The bundle height measurement was 154 cm with a maximum width of 53

cm. The hand had been initially placed on the ear and eye of the deceased but gradually retreated to the chest of the mummy. The arrangement of the palm and the hand indicated that the mummy was a nun. AMN3 was estimated to be an old-aged adult female. Sex determination of AMN3 was performed mainly from a physical examination, which revealed the presence of breasts.

AMN3 displayed no evidence of trauma or pathological infection that significantly altered the physical structure of the body. However, there were some marks of postmortem impacts on the cranial and postcranial parts of the body.

### **Burial Coffins and Wrapping Materials**

The mummified humans remain located in the YK, DS and AM were wrapped mostly using a cotton sheet and palm mat. Most importantly, a palm mat was used in most occasions and played an instrumental role in the preservation of the mummies. For instance, a deceased body buried in a coffin inside the monastery was completely decayed and skeletonized. Of the total of 221 mummies, 63% were wrapped with a cotton sheet and a palm mat (Table 5-3 & Figure 7-20).

### **Mummifications in the DS, AM and YK Study Sites**

Of the total 221 mummies, only 2% (5) were documented as natural mummification, where there was no alteration to their body (Chapters 6 and 7). Class II mummification is a purposeful exploitation of the natural process and alleviating the challenge of the limited window of natural preservation; hence, called enhanced mummification. Embalmers (Genizah) exploited and enhanced the natural process to preserve the mummies. A total of 33% (74) of the 221 mummies belonged to Class II or enhanced mummification. Class III mummification is a deliberate intervention by the genizah soon after death to improve long-term preservation of soft tissue (Aufderheide

2004). A total of 11% (24) of mummies categorized as Class III or artificially mummified human remains. Some of the mummies 11% (24) belonged to Class IV or spiritual mummification (Table 7-3). Class IV Mummification is a mental mummification where the process starts long time before death. The majority of the mummies 53% (118) belonged to Class IV or spiritual mummification (Table 7-3).

## **Dating and Isotope Analysis**

### **Radiocarbon Dating of Teeth**

Dating of mummies in the AM, DS and YK is important to establishing chronology in Ethiopia and its relationship with other contemporaneous cultures. Dating might reveal contemporaneity with mummification practices in Nubia and Egypt. Regardless of the anticipated dating outcome, it is crucial to establish a chronology and gain knowledge about traditions of mummification in the country.

Four samples were submitted for radiocarbon dating at the Lalonde AMS Laboratory, University of Ottawa, in Canada. These samples were obtained from the DS and YK. However, attempted efforts to extract samples from the AM were unsuccessful, as the mummified remains were considered sacred. Radiocarbon dating is an appropriate method to date such historical sites. The Accelerator Mass Spectrometry (AMS) technique used analyzes small samples to obtain chronometric age.

The Lalonde AMS Laboratory used pretreatment methods modeled after the Oxford Radiocarbon Accelerator Unit (ORAU) (Brock et al. 2010). Before samples were submitted, I discussed the contextual data regarding nature of extraction and extent of contamination where the samples must be treated accordingly to ensure the accuracy and reliability of the results. They were highly contaminated and the lab determined appropriate cleansing procedures to decontaminate the teeth. Consequently, the lab

inspected three teeth samples and hind skin for visible contaminants to determine the appropriate physical pretreatment. Contaminants such as dust, soil, discolorations, shellac and preservatives from the exterior parts of the samples were cleaned. The decontaminated samples were loaded into a percussion mortar and crushed until they became a coarse powder. Only the root part of the teeth was used and the remainder was kept for future laboratory analysis. The remaining part of all the teeth was reused for the purpose of isotope analysis.

Dr. Xioa-Lei Zhao performed the analysis of mass spectrometry and Dr. W.E. Kieser, Director of the lab, approved the result (Figure 7-21). Unfortunately, all four samples have a carbon 14 signature characteristic of approximately 1700-1955, because of the Seuss Effect, where natural carbon 14 signatures were affected by the burning of a fossil (Chapter 8).

### **Isotope Analysis of Hair and Bone Samples**

Stable isotopes of carbon and nitrogen ( $^{13}\text{C}/^{12}\text{C}$ ) have a broad array of application in archaeology (e.g., Chrisholm et al. 1982; Ambrose 1993; Macko et al. 1999a; Katzenberger 2000; Leach et al. 2001; Richards et al. 2001; Hedges and Reynard 2007). More specifically, the application of isotope analysis using bone, teeth and hair provides valuable data regarding diet reconstruction (Ambrose 2003; Basha et al. 2016), status variations (Ambrose 2003; Reitsema 2012) and gender difference (Ambrose 2003). The rationale behind isotope analysis is based on the variation in the number of unstable and stable isotopes.

Stable isotopes are often unchanging in a biological system but unstable isotopes change and must be replenished for the organism to exist, where plants produce their own food through the process of photosynthesis and the remaining

organisms depend on each other, called the trophic level. At the base of the trophic level, plants produce their food through two principal processes of photosynthesis, C3 and C4, with C3 plants being most trees, herbs and shrubs and crops such as wheat, barley and rice, while C4 plants are arid-adapted grasses, but also include important economic crops such as maize and millet (communication with Dr. Krigbaum).

Differential variation of the stable isotopes of carbon during photosynthesis causes C3 and C4 plants to have a distinctive and measurable carbon-isotope signature. Thus, the variation in the unstable and stable carbon isotope ratios ( $^{13}\text{C}/^{12}\text{C}$ ) is valuable in paleodietary analysis.

During the field seasons of 2014 and 2015, hair and teeth samples were collected from the DS and YK cave monasteries. Acquiring these samples was difficult, as the mummies are regarded as sacred. However, after several efforts, I was able to collect the samples carefully and recorded each properly. I explained the importance of my work to the supervisory committee, particularly how the results would benefit the local people in particular and the country in general. Some of the benefits include: the results may assist in the process of nominating the location as a World Heritage site, the study may attract more professionals and tourists through academic publication, and creating awareness about the condition of the mummies to initiate the process of their preservation.

Sampled teeth and hair from human remains from the YK and DS sites are included in this study. The first site, the YK, includes 11 individuals, where 9 samples are teeth (YKP1, YKP2, YKP3, YKP4, YKP5, YKP6, YKM9, YKM20, and YKM26) and one sample is hair (YKM3). The second site DS, includes five individuals, where four

are teeth (DSP1, DSP8, DSF28 and DSM6) and one sample is hair (DSM2) Tooth and samples collected in 2013 were sent to the University of Ottawa mainly due to easier access where the problem of shipping and handling issues are addressed within a day, since I reside in Ottawa. Each tooth and hair samples was assigned a unique number at the Lalonde AMS Lab, at the University of Ottawa. However, to interpret the results from this Lab, and analysis of new samples collected in 2015, were sent to Dr. John Krigbaum, who directs the Bone Chemistry Lab (BCL) in the Department of Anthropology, at the University of Florida. Each tooth sample was assigned a unique number at the Bone Chemistry Lab (BCL). The method used and results prepared by Dr. John Krigbaum are presented as follows.

Small samples of tooth enamel (<100 mg) were cut from the tooth using a Brassler dental drill and cutting wheel and the sampled enamel was cleaned using an abrading carbide drill bit mounted to a stationary Brassler dental drill. Each tooth enamel sample was completely cleaned of debris and adhering dentine and then ca. 20 mg of tooth enamel was ground using an acid-cleaned agate mortar and pestle, weighed and loaded into a labeled microcentrifuge tube for chemical pretreatment.

Pretreatment steps included an eight-hour oxidation procedure to remove potential organics using 50:50 diluted bleach solutions, after which samples were centrifuged and rinsed in distilled and de-ionized water (DDI-H<sub>2</sub>O) to neutral neutralize them. Samples were then pretreated in 0.2 M acetic acid to remove secondary carbonates. Samples were then centrifuged and rinsed in DDI-H<sub>2</sub>O to neutral pH and then placed in a freezer. Once frozen, samples were loaded into a freeze drier and after 48 hours, were ready for analysis using isotope ratio mass spectrometry (IRMS).

Dr. Jason Curtis (Department of Geological Sciences, University of Florida) performed the mass spectrometry on these samples. For each sample, ca. 600 micrograms of prepared tooth enamel powder was loaded into separate acid-cleaned vials and reacted with 100% orthophosphoric acid at 70° C using a Kiel III carbonate preparation device attached to a Finnigan-MAT 252 IRMS. Evolved CO<sub>2</sub> gas for each sample was measured separately online using the IRMS and data are reported in standard delta notation relative to established standards: VPDB (Vienna Pee Dee Belemnite) for carbon and oxygen results. Analytical precision was 0.030 for d<sup>13</sup>C and 0.070 for d<sup>18</sup>O based on NBS-19 standards (8) run during analysis.

Table 7-1. Crosses discovered from the AM cave monastery.

Cross Code	Mummy code	Cross length	Cross Shape	Cross engravings
AMC1	AMP2	6 cm	Circular	Wooden cross an engraved with geometric square symbols.
AMC2	AMP3	25 cm	Anthropomorphic	Wooden cross and lines radiate from the intersection to all corners.
AMC3	AMP4	11 cm	Anthropomorphic	Wooden cross and lines radiate from the intersection to all four corners.
AMC4	AMP5	06 cm	Rectangular	Wooden cross and four lines radiate from center to each corner.
AMC5	AMD1	06 cm	Rectangular	Wooden cross and two spears with sharp edges.
AMC6	AMM1	06 cm	Rectangular	Wooden cross and two spears with sharp edges.
AMC7	AMM2	07 cm	Circular	Wooden cross and two spears with sharp edges.
AMC8	AMN2	06 cm	Rectangular	Stone cross and four lines radiate from each rectangle on to each corner.
AMC9	AMM3	05 cm	Anthropomorphic	Wooden cross and two spears with sharp edges.

Table 7-2. State of wrapping condition.

Wrapping condition	Number of mummies	Percent
Cotton and mat	142	64
Hide and mat	29	13
Unwrapped	50	23
Total	221	100

Table 7-3. Types of mummification in the study sites.

Types of Mummification	No mummies	Percent
Class I - Natural	5	2
Class II - Enhance	74	33
Class III - Artificial	24	11
Class IV - Spiritual	118	53
Total	221	100



Figure 7-1. AMP2. Photo credit: Abiyot 2013



Figure 7-2. Anthropomorphic shaped cross (AMC1) on AMP2. Photo credit: Abiyot 2013



Figure 7-3. AMP3. Photo credit: Abiyot 2013



Figure 7-4. Anthropomorphic shaped cross (AMC2) on AMP3. Photo credit: Abiyot 2013



Figure 7-5. AMP4. Photo credit: Abiyot 2013



Figure 7-6. Anthropomorphic shaped cross (AMC3) on AMP4. Photo credit: Abiyot 2013



Figure 7-7. AMP5. Photo credit: Abiyot 2013



Figure 7-8. Rectangular shaped cross (AMC4) on AMP5. Photo credit: Abiyot 2013



Figure 7-9. AMD1. Photo credit: Abiyot 2013



Figure 7-10. Rectangular shaped cross (AMC5) on AMD1. Photo credit: Abiyot 2013



Figure 7-11. AMD1. Photo credit: Abiyot 2013



Figure 7-12. Rectangular shaped cross (AMC6) on AMP3. Photo credit: Abiyot 2013



Figure 7-13. AMM1. Photo credit: Abiyot 2013



A



B

Figure 7-14. Anthropomorphic shaped cross (AMC7) on AMM2. A) the front B) the back of the cross. Photo credit: Abiyot 2013



Figure 7-15. AMN2. Photo credit: Abiyot 2013



A



B

Figure 7-16. A rectangular shaped stone cross (AMC8) on AMN2. A) The front with four long engravings and B) the back with 16 short engravings. Photo credit: Abiyot 2013



Figure 7-17. AMN3. Photo credit: Abiyot 2013



Figure 7-18. AMC9 is anthropomorphic shaped leather cross that was discovered on AMN2. It is found on the right side hand fingers. Photo credit: Abiyot 2013



Figure 7-19. Burial coffin. Photo credit: Abiyot 2013

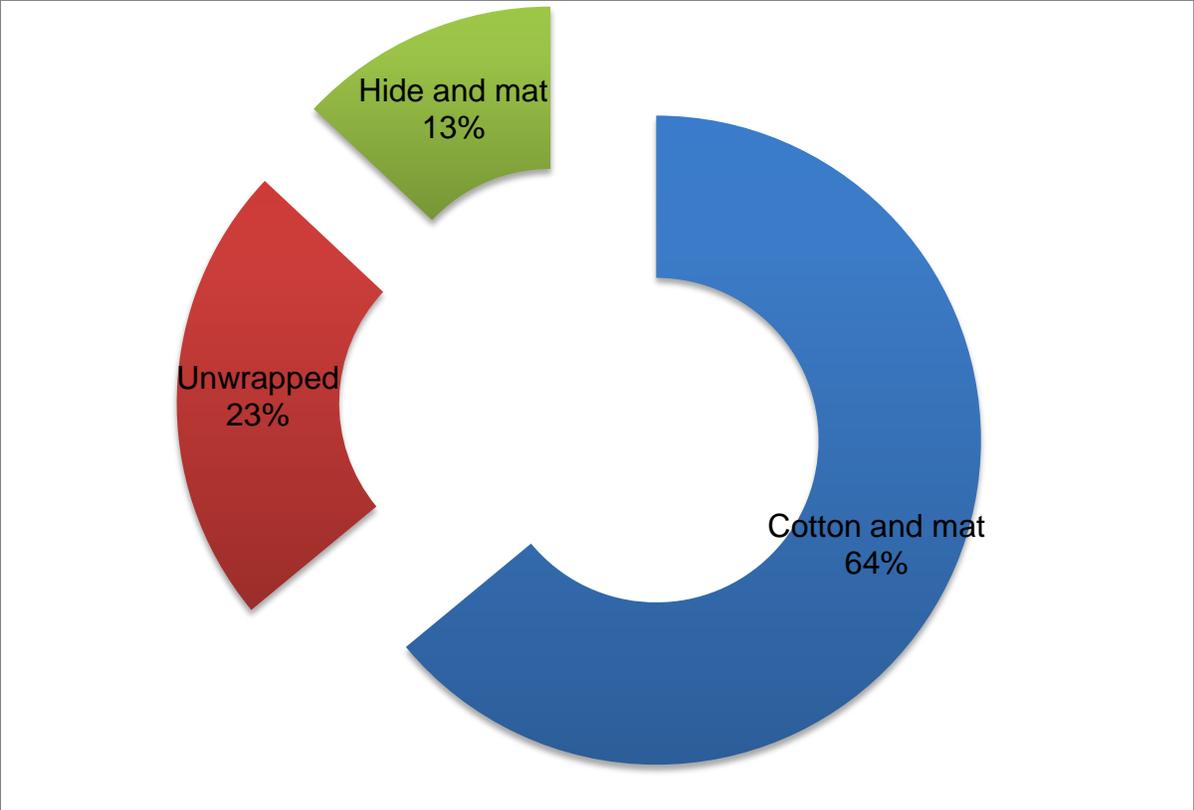


Figure 7-20. State of wrapping condition across the study site.

Lab ID	Submitter ID	cal yr AD
UOC-0742	DS-28	1893-1956
UOC-0743	YKM-20	1695-1955
UOC-0744	YKM-26	1521-1954
UOC-0745	YKM-6	1697-1956

OxCal v4.2.4 (Bronk Ramsey, 2013)  
 Post-bomb atmospheric NH<sub>2</sub> curve (Hua et al., 2013)

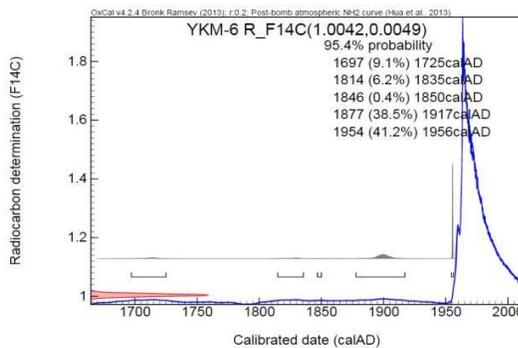
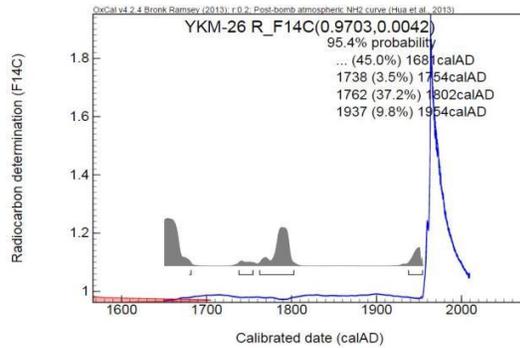
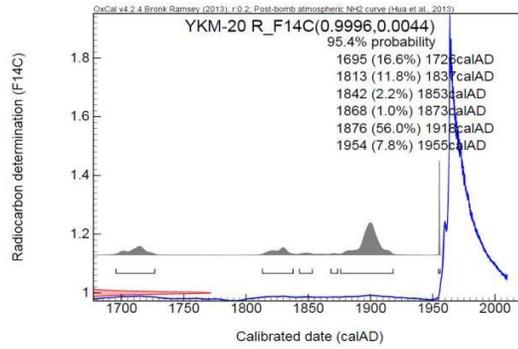
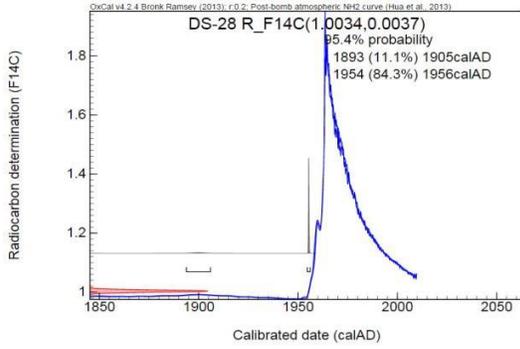


Figure 7-21. Calibrated Carbon 14 results.

## CHAPTER 8 DISCUSSION, CONCLUSION AND RECOMMENDATION

Chapter 8 presents a brief discussion, conclusion and recommendations. The issue of conservation of mummies is also briefly explained. It also outlines future research direction.

### **Discussions**

As outlined in Chapter 1, this dissertation is a bioarchaeological and osteological approach to studying the life and death of ancient and medieval Ethiopian priests. Thousands of remarkably well-preserved mummified bodies of priests and other unidentified individuals were found in the Amhara Region of Ethiopia dating from the twelfth to the twentieth centuries.

In this study, the AM, DS and YK cave monasteries - included mainly because of the presence of exceptionally well-preserved mummified human remains revealed - diachronic changes, places of peace and power, and provided clues about Christian Orthodox burial tradition. The objective of conducting rescue excavation was added to the dissertation to counterbalance the restricted access to mummies in the AM cave monastery and the unprecedented opportunity to excavate the site to better understand mummification traditions.

**Social status and burial tradition.** The classification of social status was based on an individual's role. Mummies were categorized into five groups: priests, monks, deacons, nuns and followers. The first four of these groups reflect achieved social status in the EOC. However, followers might attain either an achieved or an ascribed status. Followers who preferred the title of achieved status often paid an annual fee, prayed seven times a day and participated in community church services. These people

often led a monastic life. However, the majority of followers were nominal followers who attained ascribed status. Ascribed status is also given to the king of kings and head of the EOC, who came to power mostly due to bloodline. Apparently, most of the Aksumite kings and Solomonic Dynasty claim their descendancy to King Solomon of Jerusalem. However, the Zagwe Dynasty kings, believed to be power usurpers, assumed the kingship and head of the EOC, where the church approved their legitimacy and sanctified some of the kings of king YK and Lalibela – as saints. Regardless, most kings assumed ascribed status over the church.

Status determination for each mummy was based on non-metric assessment, textual analysis and the knowledge of local elders. Most importantly, identification of social status from mummies for this study was primarily based on the orientation of the hand. The religious text buried with the mummy, known locally as *Lifafetsidik*, also provided valuable insight into the status of the individual.

The DS cave monastery has been under reconstruction since 2010. Fortunately, the study was also carried out during the same time renovations occurred and therefore, aligned perfectly with the interest of the stakeholders. Three localities were selected based on surface findings, proximity to the old church, hauling/transporting distance to dump the excavated soil and the structure of the grave (Chapter 5). In these localities, eight burial graves were discovered where 13 individual mummified bodies were exhumed from the in-situ deposit. Limited grave goods, religious texts and crosses were recovered, a typical characteristic of Christian burial in Ethiopia.

Burial coffins were found in the DS, AM and YK. They were prepared mostly from a wooden log. Mummies buried inside a coffin without palm mats were decomposed,

but mummies wrapped with palm mats were preserved. Individuals buried in coffins had higher social status than those who were not interred in this way. Coffins were exclusively reserved for followers rather than for religious groups.

Christian Orthodox burial orientation is uniform throughout the country, all buried to rise toward the eternal East. The status of an individual is the fundamental factor for the allocation of the burial space. The higher the status, the more likely is the chance of getting a desired spot. In most cases, burial space for the ecclesiastical authorities is designated in advance. The burial chamber starts from the inner spot inside the church, which was often reserved for the highest priest. For instance, according to oral tradition, both Abba Bereded (founder of the DS) and Abune Melke Tsadik (founder of the AM) were buried inside the church. However, Yimerhane Kristos was entombed behind but close to the church. Most of the commoners were buried in the local open burial ground of a church closer to their neighborhood. The mortuary program is open to Christians and to those who claim allegiance to the Orthodox Church. However, burial grounds near monasteries were exclusive to elites.

In some cases, a person predetermines a burial place by his/her wishes. Depending on the status of the deceased, the living negotiate and renegotiate based on the wishes of the deceased. These wishes are often associated with the ancestral spirit, and people tend to respect and implement the will, a document outlining their wishes before and after their death as stated by the deceased. Some people travel a long distance just to be buried in the cave monastery while others' cadavers are transported to the place the deceased indicated in the will document. Because of these unique circumstances, burial places are not strictly limited to the local communities.

According to the high priest in the church, multiple interments are very common in the DS, given the limited space inside the cave. Some of the burial graves, uncovered and reported by the local communities during expansion of the cave, contain seven mummified bodies. Unfortunately, their identity and the reason they were interred in one burial chamber are unknown.

The mummy at the top was the oldest in burial age whereas the most recently deceased was at the bottom. When a new corpse was buried, it was covered with cotton and a timber mat. Plant remains; such as Juniper – locally named *Tsid* – and timber leaves were used between the interments. According to the priest at the site, some of the burial graves have been used for generations. For example, when a member of the family passed away, the body could be buried in the same burial grave as previously-deceased members. As such, it is common to find multiple corpses in a single grave.

Another indication of the social status was the use of one burial grave for extended family members. The multiple burial graves defy the law of superposition, where the bottom is older than the upper. In contrast to this, the fresh corpse is always placed at the bottom of the grave in the DS. Gravediggers opened the grave and removed the old corpse and excavated the grave deeper to ensure it would accommodate the new and the previously-deceased corpses. The fresh corpse is always placed at the bottom and the rest follow according to their original burial order. The entire process is strictly monitored, mainly to not upset the ancestral spirits who are believed to watch over the living.

In addition to the study sites, I have visited other places to see burial coffins and their role in social stratification. For instance, in Debre Libanos, a monastery founded in the thirteenth century – located 40 km north of Addis Ababa – may represent the EOC mortuary tradition. In this site, followers have performed mummification, single/multiple burials and primary/secondary interments. The interment situation in the Debre Libanos monastery is also diverse, ranging from barely-prepared burial coffins to those well engraved and designed as the tradition expanded. It was mainly reserved for feudal landlords from the thirteenth century to the end of the period of Emperor Haile Selassie (1930-1974). Since the downfall of Haile Selassie, the tradition further expanded to the elite in the urban areas because of the commercialization of death, where an elaborate burial practice was performed.

**Sex determination.** Most of the mummies were extremely well preserved and thus made sex determination easier. Sexing mummies was based on macroscopic examination, consulting inscribed documents and multiple morphological attributes. Standardized non-metric traits, such as mastoid process, nuchal crest and supraorbital margin, were used to determine the sex of the crania (Chapter 7). Moreover, *Lifafetsidik* was an important document used to determine the sex of an individual mummy. Mummies were regarded as the male and female servant of God, as *Legeberke* and *Leametike* respectively for sex identification.

The question is, what can the sex distribution of mummies tell us in the cave monasteries? It is obvious that there is a difference between males and females in medieval Ethiopia, but how extreme was such differentiation in accessing critical resources? Monasteries were built in very inaccessible places. Thus, traveling to the

sites requires physical strength, spiritual commitments, the ability to afford the trip and social status. In ancient and medieval Ethiopia, men tended to control resource centers. It is not surprising that the number of male mummies was almost three times greater than the number of the females. The data were consistent with the tradition where men had more access to privileged burial sites than women. As indicated in Chapter 7, the mortuary program data are skewed to men leads to the question of where were the rest of the women buried. The rest of the women and other non-elite groups were buried in the open burial grave near their local churches. Thus, the monasteries were reserved for clergy and elite class of medieval Ethiopia.

**Age determination.** Age estimation is based on the study of biological variations that take place throughout life and could offer pieces of evidence regarding age at death (White et al. 2011). An age-at-death distribution curve was skewed to the cohort of middle-aged adults (Chapter 7). Although the data are limited, they could show a higher age at death for the middle-age group, followed by the old-age group. The lowest age at death was recorded for child age group. Age at death may show shorter lifespan.

**Cause of Death.** Various scholars have offered different hypotheses for the causes of death of the ancient Egyptian mummies. Some of the major causes proposed were malnutrition and infection by parasites (Roseau 1978), possible spread of infection (Melcher et al. 1997), pneumonia (Walker et al. 1987), possible trauma (Mininberg 2001), parietal skull fracture (Hoffman and Hudgins 2002), serious cranial injury (Gallino and Santamaria 1995) and homicide (Nerlich et al. 2000).

Causes of death for the mummies were inferred based on physical examination of the corpses and sifting through historical records for any period of plagues and

starvation. Data regarding physical examination collected at the site were later followed by detailed analysis of the photographs taken in the field. I was looking for positive identification of evidence markers preserved on the cadaver. The *Lifafetsidik* provided information about the personal biography that was used as a means of positive identification. The trauma and pathology preserved on the mummies in the study sites provided positive identification of the cause of death. These pieces of evidence were supported mainly by soft tissue and bone insult preservation.

The majority of the mummies revealed no evidence for the causes of their death. However, some of them provided unique evidence into past violence. Mummies from Ethiopia provide a direct clue about violence and trauma of the past population in the study area. One of the significant advantages of studying a mummified tissue is to uncover what happened in the past, which would not otherwise be recovered from bones. Hence, bones are amenable to more consistent and prolonged insult than soft tissues. In other words, soft tissues are more susceptible to pathology and trauma.

Nancy (2007) reported that 75% of sharp force trauma impacts cause either significant injuries or death. It is evident from the extent of mutilation that this was the cause of death, often from prolonged bleeding. Multiple evidence of stabbing observed on AMF57's ribs, which signals her violent death (Figure 8-1). Proof of blunt-force trauma was revealed on the mummy found in the AM. However, no evidence of gunshots was discovered from the DS or YK cave monasteries.

The cause of death for the majority of mummies was not ascertained partly because of the limited availability of samples and lack of access to advanced noninvasive equipment such as CT scan and X-ray machines. Additional

multidisciplinary palaeopathological research would have required gathering more relevant and valuable data to enhance our understanding about Ethiopian mummies.

The preservation of AMD4 was excellent, which allowed evidence for severe trauma to be seen. The trauma included proof of stabbing. There were multiple stabbing wounds on the chest near the area where the soft organs, such as lungs and heart, are located. AMD4 also showed round holes possibly due to the impact of a large iron-shafted spear (Figure 8-1). Similar stabbing was recorded on AMFM10. Multiple cuts on the hand, ribs and head were also observed on this body. It provides a valuable insight into the nature of conflict during the life of AMFM10. The severity of the trauma was strong enough to be life threatening and might have led to the violent death of AMFM10 (Figure 8-1).

**Paleopathology.** Proof of leprosy and imbalanced diets, causing diseases such as rickets and goiter, were observed in the AM cave church. Leprosy is an ancient infectious disease – caused by the bacterium *Mycobacterium leprae* – that results in disfiguring skin nerves and bone damage in the arms and legs (Figure 8-2).

Archaeological findings of this ancient disease contain five strains. However, no tests were conducted to distinguish present from past strains. Further biomedical analysis is needed to enhance our understanding of the disease. On the other hand, the social consequences of leprosy are much more severe than the disease. According to information from the AM, the victims of the disease became outcasts due to ill-conceived hereditary transmission of the disease. Consequently, those infected were banned from serving as religious leaders in the past. Goiter was also discovered on AMFF24, indicating the shortage of iodine in the area (Figure 8-3).

Another age related pathology is the parietal thinning (Figure 8-4), which was known since eighteenth century (Cederlund & Olivecrona 1982). The thinning is attributed to various factors such as a non-progressive congenital dysplasia of the diploe, post-menopausal and senile osteoporosis (Dutta 1969; Luk et al. 2010), progressive disease and not an anatomic variant (Luk et al. 2010), and continuous pressure from the exterior (Dutta 1969; Luk et al. 2010).

**Fordisc 3.1 analysis.** As explained in Chapter 7, the inclusion of all samples in ADB resulted in an unexpected result. Thus, in consultation with C.A. Pound Lab, University of Florida, we excluded the unlikely candidate such as the Japanese, Vietnamese and Hispanic population from the Fordisc 3.1. when Howells series Fordisc 3.1 of possible could not effectively categorize the majority of the sample. Perhaps the resemblance was due to the small skull size. When the initial parameter of using all the Forensic Data Bank in Fordisc 3.1 imitated, the result was significantly different. It classifies the crania into Dogon Mali, Egypt Gizeh, 600-200 BC, Teita - S.E. Kenya, Bantu-speaking, Zulu South Africa, Black, and White. Regardless of our effort to exclude the unlikely candidate, only few of them were categorized to Egyptian. The absences of Ethiopian skulls on the Forensic Data Bank limited the ability of Fordisc applicability to only represented samples. The presence of high genetic admixture in Ethiopia also complicates the basic assumption of Fordisc where “the unique craniofacial form of a given population remains stable through generational time and is largely resistant to environmental factors” (Belcher & Armelagos 2005, p. 340). Ethiopia is a melting pot for the genetic admixture mainly with Middle East and Europe. Fordisc is more appropriate to American population where there are substantial data

representations on the Forensic Data Bank. Thus, application of Fordisc to Ethiopian population is limited. The inclusion of the YK data set into the Forensic Data Bank could alleviate the problem of reference population and thereby expand the application of Fordisc.

**Type of mummification.** As explained in Chapter 2, mummification is divided into four classes namely Class I or natural mummification, Class II or enhanced mummification, Class III or artificial mummification and Class IV or spiritual mummification. Class I is the result of natural desiccation where the body is quickly dehydrated. Decomposition was arrested by hot, or cold conditions, yet, optimal to permit spontaneous mummification. Jeremiah (2014) argues that extreme hot or cold weather is needed for the natural mummification. He further explains that the right types of soil, preservative fungi and allowing body fluids to drain, and other conditions are the catalyst needed to permit natural mummification.

Cave environments are consistently dry and hot during the daytime but cold at the nighttime. Such alternating changes of temperature arrest the growth of the microorganism and provide preferred optimal conditions for spontaneous mummification. However, such weather conditions are not attained throughout the year, as there are four distinct seasonal fluctuations in Ethiopia. Consequently, natural mummification has occurred during at a limited window. As a result, some of the mummies were preserved extremely very well while others were skeletonized. Class I was the cheapest form of mummification as no extra cost is needed, and was possibly used by those who could not afford elaborate mummification.

Class IV mummification or mental mummification is a deliberate and painful process taking several decades, where monks and nuns engaged in a period of seclusion, self-mutilation and prayer for an extended time. According to oral tradition in the AM and DS, it is customary for the monks and nuns to practice longer periods of prayer and fasting for years. The gradual reduction of their diet continues to the extent they could survive without any food. Monastery documents revealed that Abune Melke Tsadik and Abba Bereded went under periods of seclusion, self-mutilation and praying for forty days and night. Unlike other groups, the practice of self-mummification occurred during one's lifetime. As a result, all the Priests, Monks and Nuns are categorized as spiritual mummification or preferably mental mummification.

**Absolute and relative dating.** Although the results obtained from the mummies were affected by several factors such as the likelihood of sampling the oldest mummy, contamination, and Seuss Effect, a new chronometric dating of YK revealed an interesting result, where the site was dated back to the eleventh century. New studies revealed based on Carbon 14, the church was dated eleventh century (communication with Mengistu). Thus, the mummies might have been interred sometime in the twelfth century. According to monasteries' records, the AD and DS cave monasteries were dated to Emperor Beide Mariam (1468-1478). The stratigraphic section of the monasteries also provided a series of occupational layers. Dating the layers could reveal important information about the chronological age of the area.

**Diet analysis.** All samples analyzed produced good results. The two individuals from the DS site produced quite disparate results to one another with respect to  $d^{13}C$ , which suggests that these two individuals were not part of the same community during

the period when their respective teeth were forming (the  $d^{13}\text{C}$  value for DS-2's Canine is  $-13.5\text{‰}$  while for DS-8's Incisor is  $-2.8\text{‰}$ ). With respect to  $d^{18}\text{O}$  values, the two DS individuals averaged  $-0.4 \pm 0.99\text{‰}$ , which demonstrates some variation but not beyond what may be expected from the Horn of Africa during the later Holocene.

The five individuals from the YK site averaged  $-11.4 \pm 0.65\text{‰}$  for  $d^{13}\text{C}$  and  $-0.6 \pm 0.55\text{‰}$  for  $d^{18}\text{O}$ . These data suggest that the individuals represented in the YK sample had a predominantly C3-based diet. Again, the  $d^{18}\text{O}$  values observed seem consistent with eastern Africa and do not inform on the dietary patterns observed from the carbon isotope ratios derived from tooth enamel for these two separate sample populations.

### **Conclusion**

Religion and mummification practices are closely interrelated in Ethiopia and Eritrea. However, the origin of mummification in the Horn of Africa is dubious. After studying the tradition of mummification for many years, my hypothesis is that spontaneous/natural mummification began during an unknown time in the past when people used to live in caves. Cave environments provided suitable conditions for preserving organic materials. Hence, natural mummification showed the way for the origin of mummification in Ethiopia, which was later consolidated with the introduction of artificial mummification. The earliest artificial mummification in the country is associated with early monastic life during the introduction of Christianity into Ethiopia. The tradition of mummification further expanded with the subsequent arrival of the Nine Saints. The rulers of ancient and medieval Ethiopia may have used mummification to consolidate their power and control over the peasants, who represented the majority of the

population. Most of the medieval kings assumed the title of priest-kings, as they were kings of the kingdom and heads of EOC.

It is believed that mummified bodies are everlasting, where the body neither perishes nor decays for ages, signifying the religious importance of mummification. It is all about power (the power of the living versus the power of the ancestral spirit). To further explain, mummification is about the power of the living (deceased family) over the living where they prepared the deceased in desired manner to project their power even by redefining the wishes of the dead. Thus, the practice of elaborate mummification has been a means to negotiate and renegotiate the power of the living by the living or alternatively the power of the dead by the living. In a way, the mummified body's spirit was used as a means to protect the living from evil (Aufderheide 2003; Cockburn et al. 2003; Jeremiah 2014; Koller et al. 2005; Taylor 2001). For example, in Konso, southern Ethiopia, a mummified king's body is believed to have the power to scare away the evil.

Mummification is not a Christian tradition; hence, the body is irrelevant for resurrection, as no matter what happened to the body, it would be resurrected. As explained in Chapter 2, mummification certainly predates the Christian era, which ancient Egyptians and Nubians practiced for Millennia. The tradition of mummification has been reconfigured, adapted and incorporated into Orthodox Christianity. Some of the traditions include pilgrims, relics, and orientation of burial and placement of hands on the body.

Monasteries were the powerhouses of medieval Ethiopia to which people made pilgrimages from inside and outside of the country. The objective was to be buried in a

holy place, a monastery. The use of relics – where people took bits of the mummies for spiritual or physical healing purposes, a pre-Christian tradition – was incorporated and practiced by the local people. The orientation of the burial tradition of eternal East is also a tradition that predated Christianity and was practiced by ancient Romans before the introduction of Christianity; it was later adopted by the Eastern Orthodox Church. Another pre-Christian tradition was the arrangement of the hand. For example, ancient Egyptians initially placed the mummy's hand on the genitals to mark status, later replacing this with crisscrossing of the hands. Although the meaning and symbolic representation of the physical orientation are different, the orientation style of the priest might have been imitated from the ancient Egyptians, particularly by the Egyptian-appointed patriarch of EOC.

Hawass (2000) argues that the rise of Christianity was not a factor for the decline of mummification practices in Egypt. The practice of mummification was not banned in any biblical text. Rather, the practice declined partly due to the impact of monasticism, where monks denounced the tradition. The termination of mummification was often associated with the conquest of the Arabs.

In contrast to ancient Egyptian mummification, the practice of mummification in Ethiopia evolved and more than 75% of the mummies found in the study sites were categorized as mental mummification/. It includes priests, monks and nuns. In Orthodox Christianity, emphasis is given to the soul rather than the body, as the latter is the vehicle to reach to the next world. The living are still using the dead to reflect their socio-cultural and religious identity. Strangely, mummification is neither officially permitted nor prohibited.

## Recommendations

Mummies and monasteries are a unique, tangible cultural heritage of ancient and medieval Ethiopia. However, mummies in particular and monasteries in general, are facing imminent danger of destruction from multiple deterioration factors:

A) Geological factors, mainly the rock formations and fractured ceilings, have already smashed and buried several mummies.

B) climatic factor related to temperature fluctuation as the local climate is constantly changing and gradually affecting the condition of preservation.

C) Biological factors including rats, rodents, bats, insects (Figure 8-5), mosses, bacteria and fungi pose an existential threat to the mummies (Mengistu 2004).

D) The impact of local people and tourists, who take parts of a mummy for physical and spiritual healing.

Some of the deterioration factors require immediate attention while others could be mitigated later.

The study of mummies and mummification requires multi-disciplinary research from a wide range of disciplines, mainly archaeology, osteology, bioarchaeology, biomedical and others to conduct holistic research and to answer various questions that may arise from each discipline.

These monasteries must find a way to conserve the mummies. The mummies in their current condition may not last much longer because of the several deterioration factors mentioned above. For example, in the AM cave monastery, a museum was constructed for the mummies; the other monasteries should follow in the footsteps of the AM.

ARCCH should also advocate for the expansion of open archaeological sites in selected high volume tourist destination areas to preserve cultural heritage in one hand and promote tourism in the country.

The YK monastery well exceeds the requirements of UNESCO to be a World Heritage Site. Unfortunately, one of the greatest heritages of medieval Ethiopia, which is almost a century older than Lalibela, is not inscribed in the World Heritage List. ARCCH's effort to inscribe the site should be sped up with the preparation of a management plan for the inscription and inclusion of the site.

### **Future Studies**

Recent advances in science and technology significantly revolutionized the study of mummies and mummification. The use of computerized tomography (CT) scanning, advanced portable X-raying, dating, isotopic and DNA analysis and new methods permitted noninvasive extraction of data (Hawass et al. 2016). For example, CT scanning and advanced software applications made the digital reconstruction of mummies possible without altering their condition.

The Geez script buried with the mummies needed further analysis. It contains substantial information about the bodies, possibly about the mummification practices. Similar mummies are found in different monasteries throughout the country, which are not yet studied. Further research in the area could provide more knowledge about barely known mummification tradition in Ethiopia.



Figure 8-1. Multiple stabbing on the hand, ribs and skull of AMFM10. Photo credit: Abiyot 2013



Figure 8-2. The leg of AMFF5 severely damaged by Leprosy. Photo credit: Abiyot 2013



Figure 8-3. Mummified and well-preserved goiter on AMFF 24. Photo credit: Abiyot 2013



Figure 8-4. YK 57 biparietal resorption or bilateral concentric parietal thinning. Photo credit: Abiyot 2013



Figure 8-5. Taphonomic impact insect feeding on the mummies. Photo credit: Abiyot 2013

## LIST OF REFERENCES

- Abdel-Maksoud, G., & El-Amin, A. R. (2011). A review on the materials used during the mummification processes in ancient Egypt. *Mediterranean Archaeology and Archaeometry*, 11(2), 129-50.
- Adams, B. J., & Konigsberg, L. W. (2004). Estimation of the most likely number of individuals from commingled human skeletal remains. *American Journal of Physical Anthropology*, 125(2), 138-151.
- Ambrose, S. H., Buikstra, J., & Krueger, H. W. (2003). Status and gender differences in diet at Mound 72, Cahokia, revealed by isotopic analysis of bone. *Journal of Anthropological Archaeology*, 22(3), 217-226.
- Andrews, C. (2004). *Egyptian mummies*. Harvard University Press.
- Anfray, F. (1994). Preservation and presentation of the cultural heritage: Eritrea.
- Anfray, F. (1985). Des églises et des grottes rupestres. In *Annales d'Ethiopie* 13 (1), 7-34.
- Asrat, A. (2009). The Temple of Yeha: geo-environmental implications on its site selection and preservation. In *Conference of Ethiopian Studies* 1(1), 9-26.
- Asrat, A. (2002). The Rock-Hewn churches of Tigray, northern Ethiopia: a geological perspective. *Geoarchaeology*, 17(7), 649-663.
- Asrat, A., & Ayallew, Y. (2011). Geological and geotechnical properties of the medieval rock hewn churches of Lalibela, Northern Ethiopia. *Journal of African Earth Sciences*, 59(1), 61-73.
- Asrat, A., Demissie, M., & Mogessie, A. (2012). Geoheritage conservation in Ethiopia: the case of the Simien Mountains. *Quaestiones Geographicae*, 31(1), 7-23.
- Assefa, Z., Pleurdeau, D., Duquesnoy, F., Hovers, E., Pearson, O., Asrat, A., & Lam, Y. M. (2014). Survey and explorations of caves in southeastern Ethiopia: Middle Stone Age and Later Stone Age archaeology and Holocene rock art. *Quaternary International*, 343, 136-147.
- Assmann, E. J. (2015). *Death and salvation in ancient Egypt*. Cornell University Press.
- Aufderheide, A. C. (2003). *The scientific study of mummies*. Cambridge University Press.

- Aufderheide, A. C., Salo, W., Madden, M., Streitz, J., Buikstra, J., Guhl, F., & Allison, M. (2004). A 9,000-year record of Chagas' disease. *Proceedings of the National Academy of Sciences of the United States of America*, 101(7), 2034-2039.
- Aufderheide, A. C., Cartmell, L., Zlonis, M., & Sheldrick, P. (2004). Mummification practices at Kellis site in Egypt's Dakhleh Oasis. *The Journal of Society Study Egyptian Antiquities* (31), 63-86.
- Aufderheide, A. C., Zlonis, M., Cartmell, L. L., Zimmerman, M. R., Sheldrick, P., Cook, M., & Molto, J. E. (1999). Human mummification practices at Ismant el-Kharab. *The Journal of Egyptian Archaeology*, (15)197-210.
- Banning, E. B. (2002). *Archaeological survey* (Vol. 1). Springer Science & Business Media.
- Bantalem T. (2004) Tana: A home of Monasteries, *Addis Ababa: Gebre Egziabher Baye*.
- Barakat, A. O., Mostafa, A., Qian, Y., Kim, M., & Kennicutt, I. I. (2005). Organic geochemistry indicates Gebel El Zeit, Gulf of Suez, is a source of bitumen used in some Egyptian mummies. *Geoarchaeology*, 20(3), 211-228.
- Bard, K. A., Coltorti, M., DiBlasi, M. C., Dramis, F., & Fattovich, R. (2000). The environmental history of Tigray (Northern Ethiopia) in the Middle and Late Holocene: a preliminary outline. *African Archaeological Review*, 17(2), 65-86.
- Bard, K. A., Fattovich, R., Manzo, A., & Perlingieri, C. (1997). Archaeological investigations at Bieta Giyorgis (Aksum), Ethiopia: 1993–1995 field seasons. *Journal of Field Archaeology*, 24(4), 387-403.
- Basha, W. A., Chamberlain, A. T., Zaki, M. E., Kandeel, W. A., & Fares, N. H. (2016). Diet reconstruction through stable isotope analysis of ancient mummified soft tissues from Kulubnarti (Sudanese Nubia). *Journal of Archaeological Science: Reports*, 5, 71-79.
- Bass, W. M. (1995). *Human osteology: A laboratory and field manual*. Columbia, Missouri Archaeological Society, 24(4), 387-403
- Beckingham, C. F., & Tamrat, T. (1974). Church and State in Ethiopia. *The Journal of African History*, 15(01), 137-140.
- Belcher, R., & Armelagos, G. (2005). Forensic misclassification of ancient Nubian crania: implications for assumptions about human variation. *Current Anthropology*, 46(2), 340-346.

- Billi, P. (2015). Geomorphological Landscapes of Ethiopia. In *Landscapes and Landforms of Ethiopia* (3) 1-32. Springer Netherlands.
- Bosc-Tiessé, C., Derat, M.-L., Bruxelles, L., Fauvelle-Aymar, F.-X., Gleize, Y., & Mensan, R. (2014). The Lalibela rock hewn site and its landscape (Ethiopia): An archaeological analysis. *Journal of African Archaeology*, 12(2), 141-164
- Brewer, D. J., & Teeter, E. (2008). *Egypt and the Egyptians*. Cambridge: Cambridge University Press.
- Brier, B., Vinh, P., Schuster, M., Mayforth, H., & Johnson Chapin, E. (2015). A radiologic study of an ancient Egyptian mummy with a prosthetic toe. *The Anatomical Record*, 298(6), 1047-1058.
- Brock, F., Higham, T., Ditchfield, P., & Bronk Ramsey, C. (2010). Current pretreatment methods for AMS radiocarbon dating at the Oxford Radiocarbon Accelerator Unit (ORAU). *Radiocarbon*, 52(1), 103-12.
- Buikstra, J. E., & Ubelaker, D. H. (1994). Standards for data collection from human skeletal remains.
- Buikstra, J. E., & Beck, L. A. (2006). *Bioarchaeology: the contextual analysis of human remains*. Academic Press.
- Butzer, K. W. (2008). Challenges for a cross-disciplinary geoarchaeology: the intersection between environmental history and geomorphology. *Geomorphology*, 101(1), 402-411.
- Buxton, D. (1972). Some Long-Forgotten Rock-Hewn Churches in Northern Ethiopia. *African Affairs*, 71(285), 442-443.
- Cardin, M. (2015). *Mummies around the world: An encyclopedia of mummies in history, religion, and popular culture*. Santa Barbara, Calif.
- Carillet, J.-B., Butler, S., & Starnes, D. (2009). *Ethiopia & Eritrea*. Footscray, Victoria, Australia: Lonely Planet.
- Carver, M., Gaydarska, B. I., & Montón-Subías, S. (2015). *Field archaeology from around the world: Ideas and approaches*: Springer.
- Cederlund, C. G., Andrén, L., & Olivecrona, H. (1982). Progressive bilateral thinning of the parietal bones. *Skeletal Radiology*, 8(1), 29-33.
- Chamberlain, A. T. (November 01, 2003). The scientific study of mummies. *International Journal of Osteoarchaeology*, 13 (6), 393-394.

- Ciampalini, R., Billi, P., Ferrari, G., Borselli, L., & Follain, S. (2012). Soil erosion induced by land use changes as determined by plough marks and field evidence in the Aksum area (Ethiopia). *Agriculture, Ecosystems & Environment*, 146(1), 197-208.
- Clark, O. A. (2003). *Seeing beneath the soil: prospecting methods in archaeology*. Routledge.
- Cockburn, A., Cockburn, E., & Reyman, T. A. (1998). *Mummies, disease and ancient cultures*. Cambridge University Press.
- Crummey, D. (1997). Class in Ethiopian history. *The Journal of African History*, 38(02), 301-358.
- Crummey, D. (1990). Society, state and nationality in the recent historiography of Ethiopia. *The Journal of African History*, 31(01), 103-119.
- Crummey, D. (2000). *Land and Society in the Christian Kingdom of Ethiopia: from the Thirteenth to the Twentieth Century*. University of Illinois Press.
- Cox, S. L. (2015). A critical look at mummy CT scanning. *The Anatomical Record*, 298(6), 1099-1110.
- D'Andrea, A. C., Manzo, A., Harrower, M. J., & Hawkins, A. L. (2008). The Pre-Aksumite and Aksumite settlement of NE Tigray, Ethiopia. *Journal of Field Archaeology*, 33(2), 151-176.
- Darbyshire, I., Lamb, H., & Umer, M. (2003). Forest clearance and regrowth in northern Ethiopia during the last 3000 years. *The Holocene*, 13(4), 537-546.
- David, R. (Ed.). (2008). *Egyptian mummies and modern science*. Cambridge University Press.
- Decker, S. J., Davy-Jow, S. L., Ford, J. M., & Hilbelink, D. R. (2011). Virtual determination of sex: metric and nonmetric traits of the adult pelvis from 3D computed tomography models. *Journal of forensic sciences*, 56(5), 1107-1114.
- DiMaio, V. J. (2015). *Gunshot wounds: practical aspects of firearms, ballistics, and forensic techniques* (Vol. 62). CRC Press.
- Dunand, F., & Lichtenberg, R. (2006). *Mummies and death in Egypt*. Cornell University Press.
- Dutta, P. C. (1969). Bilateral parietal thinning in Bronze Age skull. *British medical journal*, 1(5635), 55.

- Edwards, D. N. (2007). The archaeology of Sudan and Nubia. *Annual Review of Anthropology*, 36(1), 211.
- Elliott, M., & Collard, M. (2009). Fordisc and the determination of ancestry from cranial measurements. *Biology letters*.
- Eshetu, Z. (2002). Historical C3~C4~ vegetation pattern on forested mountain slopes: its implication for ecological rehabilitation of degraded highlands of Ethiopia by afforestation. *Journal of Tropical Ecology*, 18(5), 743-758.
- Fattovich, R. (2010). The Development of Ancient States in the Northern Horn of Africa, c. 3000 BC-AD 1000: An Archaeological Outline. *Journal of World Prehistory*, 23(3), 145-175.
- Fattovich, R., & Bard, K. A. (2001). The Proto-Aksumite period: An overview. *Annales D'ethiopie*, 17(1), 3-24.
- Finneran, N. (2013). *The Archaeology of Ethiopia*. Hoboken: Taylor and Francis.
- Finneran, N. (2012). Lalibela in its landscape: Archaeological survey at Lalibela, Lasta, Ethiopia, April to May 2009. *Azania: the Journal of the British Institute of History and Archaeology in East Africa*, 47(1), 81-98.
- Finneran, N. (2005). The Archeological Landscape of the Shire Region, Western Tigray, Ethiopia. *Annales d'Ethiopie* 21(1), 7-29.
- Finneran, N. (2009a). Settlement archaeology and oral history in Lasta, Ethiopia: Some preliminary observations from a landscape study of Lalibela. *Azania: Archaeological Research in Africa*, 44, 281-291.
- Finneran, N. (2009b). Built by angels? Towards a buildings archaeology context for the rock-hewn medieval churches of Ethiopia. *World Archaeology*, 41(3), 415-429.
- Fodor, J., Malott, J. C., & King, A. Y. (1982). The radiographic investigation of two Egyptian mummies. *Radiologic technology*, 54(6), 443-448
- French, C., Sulas, F., & Madella, M. (2009). New geoarchaeological investigations of the valley systems in the Aksum area of northern Ethiopia. *Catena*, 78(3), 218-233.
- Freid, D., Spradley, M. K., Jantz, R. L., & Ousley, S. D. (2005, January). The truth is out there: how NOT to use FORDISC. In *American Journal of Physical Anthropology* (40) 103-103..
- Gallino, M., & Santamaria, E. (1995). [Radiologic and skeletal-anatomical study of mummies at the Tourin Egyptian Museum]. *Minerva medica*, 86(11), 503-506.

- Gatto, M. C., & Zerboni, A. (2015). Holocene Supra-Regional Environmental Changes as Trigger for Major Socio-Cultural Processes in Northeastern Africa and the Sahara. *African Archaeological Review*, 32, 2, 301-333.
- Gerster, G. (1970). *Churches in rock: Early Christian art in Ethiopia*. Phaidon Praeger.
- Ginter, J. K. (2005). A test of the effectiveness of the revised maxillary suture obliteration method in estimating adult age at death. *Journal of Forensic Science*, 50(6), 520-7.
- Gostner, P., Bonelli, M., Pernter, P., Graefen, A., & Zink, A. (2013). New radiological approach for analysis and identification of foreign objects in ancient and historic mummies. *Journal of Archaeological Science*, 40(2), 1003-1011.
- Guillén S.E. 2004. "Artificial Mummies from the Andes." *Collegium Antropologicum* 28: 141-57.
- Haas, C. (2008). Mountain Constantines: The Christianization of Aksum and Iberia. *Journal of Late Antiquity*, 1(1), 101-126.
- Halcrow, S. E., & Tayles, N. (2008). The bioarchaeological investigation of childhood and social age: problems and prospects. *Journal of Archaeological Method and Theory*, 15(2), 190-215.
- Hamm, S., Bleton, J., & Tchaplal, A. (2004). Headspace solid phase micro extraction for screening for the presence of resins in Egyptian archaeological samples. *Journal of separation science*, 27(3), 235-243.
- Hancock, G. (1993). *Sign and the Seal: The Quest for the Lost Ark of the Covenant*. Simon and Schuster.
- Hart, G. O. (2005). Fracture pattern interpretation in the skull: differentiating blunt force from ballistics trauma using concentric fractures. *Journal of Forensic Science*, 50(6), 219-236.
- Hawass, Z. A. (2005). *Tutankhamun and the Golden Age of the Pharaohs*. National Geographic Books.
- Hawass, Z. A., Saleem, S., & In D'Auria, S. (2015). *Scanning the Pharaohs: CT Imaging of the New Kingdom Royal Mummies*
- Hawkey, D. E., & Merbs, C. F. (1995). Activity- induced musculoskeletal stress markers (MSM) and subsistence strategy changes among ancient Hudson Bay Eskimos. *International Journal of Osteoarchaeology*, 5(4), 324-338.

- Heldman, M. E. (2007). *Metropolitan Bishops as Agents of Artistic Interaction Between Egypt and Ethiopia During the Thirteenth and Fourteenth Centuries*. Index of Christian Art, Department of Art & Archaeology, Princeton University.
- Hoffman, H., & Hudgins, P. A. (2002). Head and skull base features of nine Egyptian mummies: evaluation with high-resolution CT and reformation techniques. *American Journal of Roentgenology*, 178(6), 1367-1376.
- Houston, D. D., & Brooks-Bertram, P. (2007). *Wonderful Ethiopians of the Ancient Cushite Empire: Origin of the Civilization from the Cushites*. Suny Press.
- Hubbe, M., & Neves, W. A. (2007). On the misclassification of human crania. *Current anthropology*, 48(2), 285-288.
- Ikram, S. (2013). Mummies and mummification. *The Encyclopedia of Ancient History*.
- Jantz, R. L., Kimmerle, E. H., & Baraybar, J. P. (2008). Sexing and stature estimation criteria for Balkan populations. *Journal of forensic sciences*, 53(3), 601-605.
- Jantz, R. L., & Ousley, S. D. (2005). Fordisc, version 3.0. *University of Tennessee: Knoxville, TN*.
- Jantz, R. L., & Owsley, D. W. (1997). Pathology, taphonomy, and cranial morphometrics of the Spirit Cave Mummy. *Nevada Historical Society Quarterly*, 40(1), 62-84.
- Jeremiah, K. (2014). *Eternal Remains: World Mummification and the Beliefs that make it Necessary*. Sarasota: First Edition Design Inc.
- Owen Jarus (2010) Baboon mummy analysis reveals Eritrea and Ethiopia as location of land of Punt. Independent. Retrieved June 10, 2012 from <http://www.independent.co.uk/life-style/history/baboon-mummy-analysis-reveals-eritrea-and-ethiopia-as-location-of-land-of-punt-1954547.html>
- Kaplan, S. (1995). *The beta Israel (Falasha) in Ethiopia: from earliest times to the twentieth century*. NYU Press.
- Karger, B., Niemeyer, J., & Brinkmann, B. (2000). Suicides by sharp force: typical and atypical features. *International journal of legal medicine*, 113(5), 259-262.
- Keita, S. O. Y. (2007). On Meroitic Nubian crania, Fordisc 2.0, and human biological history. *Current Anthropology*, 48(3), 425-427.
- Kimura, B. K. (2004). *An archaeological Investigation into the History and Socio-Political Organization of Konso, Southern Ethiopia* (Doctoral dissertation, University of Florida).

- Kiros, A., Lazic, V., Gigante, G. E., & Gholap, A. V. (2013). Analysis of rock samples collected from rock hewn churches of Lalibela, Ethiopia using laser-induced breakdown spectroscopy. *Journal of Archaeological Science*, 40(5), 2570-2578.
- Leathers, A., Edwards, J., & Armelagos, G. J. (2002, January). Assessment of classification of crania using Fordisc 2.0: Nubian X-Group Test. In *American Journal of Physical Anthropology* (99-100).
- Lucas, G. (2002). *Critical approaches to fieldwork: contemporary and historical archaeological practice*. Routledge.
- Luk, S. Y., Shum, J. S. F., Chan, J. K. W., & San Khoo, J. L. (2010). Bilateral thinning of the parietal bones: a case report and review of radiological features. *Pan African Medical Journal*, 4(7).
- Lynnerup, N. (2007). Mummies. *American Journal of Physical Anthropology*, 134(S45), 162-190.
- Macko, S. A., Engel, M. H., Andrusevich, V., Lubec, G., O'Connell, T. C., & Hedges, R. E. (1999). Documenting the diet in ancient human populations through stable isotope analysis of hair. *Philosophical Transactions of the Royal Society of London B: Biological Sciences*, 354(1379), 65-76.
- Maiden, N. (2009). Ballistics reviews: mechanisms of bullet wound trauma. *Forensic science, medicine, and pathology*, 5(3), 204-209.
- Marks, M. K. (1995). William M. Bass and the development of forensic anthropology in Tennessee. *Journal of Forensic Science*, 40(5), 741-750.
- Mathe, C., Culioli, G., Archier, P., & Vieillescazes, C. (2004). Characterization of archaeological frankincense by gas chromatography–mass spectrometry. *Journal of Chromatography A*, 1023(2), 277-285.
- Maphill . Retrieved April 10, 2016 from <http://www.maphill.com/searchresults/?search=north%20Shewa%2FNorth%20Wello>
- Mengistu, G. (2004). Lalibela and Yimrehane Kirstos: The living witnesses of Zagwe dynasty. *Addis Ababa: Gebre Egziabher Baye*.
- Mininberg, D. T. (2001). The museum's mummies: an inside view. *Neurosurgery*, 49(1), 192-199.
- Naar, N. A., Hilgenberg, D., & Armelagos, G. J. (2006, January). Fordisc 2.0 the ultimate test: What is the truth? In *American Journal of Physical Anthropology*. (4) 136-136).
- Nissenbaum, A., & Buckley, S. (2013). Dead Sea asphalt in ancient Egyptian mummies—why? *Archaeometry*, 55(3), 563-568.

- Oba, G. (2014). *Climate Change Adaptation in Africa: An Historical Ecology*. Routledge.
- Ogbazghi, W., Rijkers, T., Wessel, M., & Bongers, F. (2006). Distribution of the frankincense tree *Boswellia papyrifera* in Eritrea: the role of environment and land use. *Journal of Biogeography*, 33(3), 524-535.
- Ousley, S. D., & Jantz, R. L. (2012). Fordisc 3 and statistical methods for estimating sex and ancestry. *A Companion to Forensic Anthropology*, 311-329.
- Ousley, S., Jantz, R., & Freid, D. (2009). Understanding race and human variation: why forensic anthropologists are good at identifying race. *American Journal of Physical Anthropology*, 139(1), 68-76.
- Pankhurst, R. (2002). *The Ethiopians: A history*. Oxford: Blackwell Publishers.
- Paulos, T. (1968). *The Fetha nagast: The Law of the kings*. Addis Ababa, Ethiopia: Faculty of Law, Haile Sellassie I University.
- Pettigrew, T. J. (1834). *A history of Egyptian mummies: And an account of the worship and embalming of the sacred animals by the Egyptians: With remarks on the funeral ceremonies of different nations, and observations on the mummies of the Canary Islands, of the ancient Peruvians, Burman priests*. Longman.
- Phillipson, D. W. (2012). *Foundations of an African Civilisation: Aksum & the Northern Horn, 1000 BC-1300 AD*. Boydell & Brewer Ltd.
- Phillipson, D. W. (2009). *Ancient churches of Ethiopia*. New Haven: Yale University Press.
- Phillipson, D. W. (2008). Changing settlement patterns in northern Ethiopia: an archaeological survey evaluated. *AZANIA: Journal of the British Institute in Eastern Africa*, 43(1), 133-145.
- Phillipson, D. W. (2004). The Aksumite roots of medieval Ethiopia. *Azania: Journal of the British Institute in Eastern Africa*, 39(1), 77-89.
- Phillipson, D. (2003). Aksum. *Azania: Archaeological Research in Africa*, 38(1), 1-68.
- Phillipson, D. W. (1998). *Ancient Ethiopia: Aksum, its antecedents and successors*. British Museum Press.
- Phillipson, D. W., & Schmidt, P. R. (2009). Re-evaluating the Archaeology of the First Millennium BC in the Northern Horn. *African Archaeological Review*, 26(4), 255-256.

- Reitsema, L. J., & Vercellotti, G. (2012). Stable isotope evidence for sex- and status- based variations in diet and life history at medieval Trino Vercellese, Italy. *American journal of physical anthropology*, 148(4), 589-600.
- Renzulli, A., Antonelli, F., Margottini, C., Santi, P., & Fratini, F. (2011). What kind of volcanite the rock-hewn churches of the Lalibela UNESCO's world heritage site are made of? *Journal of Cultural Heritage*, 12(2), 227-235.
- Rollo, F., Luciani, S., Canapa, A., & Marota, I. (2000). Analysis of bacterial DNA in skin and muscle of the Tyrolean iceman offers new insight into the mummification process. *American journal of physical anthropology*, 111(2), 211.
- Sani, F., Moratti, G., Coli, M., Laureano, P., Rovero, L., Toniatti, U., & Coli, N. (2012). Integrated geological-architectural pilot study of the Biet Gabriel-Rufael rock hewn church in Lalibela, northern Ethiopia. *Italian Journal of Geosciences*, 131(2), 171-186.
- Schmid, T., Koch, M., DiBlasi, M., & Hagos, M. (2008). Spatial and spectral analysis of soil surface properties for an archaeological area in Aksum, Ethiopia, applying high and medium resolution data. *Catena*, 75(1), 93-101.
- Schmidt, P. R. (2009). Variability in Eritrea and the archaeology of the northern Horn during the first millennium BC: Subsistence, ritual, and gold production. *African Archaeological Review*, 26(4), 305-325.
- Schmidt, P. R., Curtis, M. C., & Teka, Z. (2008). *The archaeology of ancient Eritrea*. Red Sea Press.
- Scholz-Böttcher, B. M., Nissenbaum, A., & Rullkötter, J. (2013). An 18th century medication "Mumia vera aegyptica"—Fake or authentic?. *Organic geochemistry*, 65, 1-18.
- Shaw, G. J. (2012). *The Pharaoh: Life at Court and on Campaign*. Thames & Hudson.
- Crook, D. P., & Crook, P. (2012). *Grafton Elliot Smith, Egyptology and the Diffusion of Culture: A Biographical Perspective*. Sussex Academic Press.
- Strauss, P. L. (2009). *The Fetha Nagast: The law of the kings*. Durham, NC: Carolina Academic Press.
- Sergew H. (1972) *Ancient and medieval Ethiopian history to 1270*.
- Taddesse, T. (1972). *Church and state in Ethiopia, 1270-1527*. Oxford: Clarendon Press.
- Taylor, J. H. (2001). *Death and the afterlife in ancient Egypt*. University of Chicago Press.

- Taylor, J. H. (2010). *Journey through the afterlife: Ancient Egyptian Book of the Dead*. Harvard University Press.
- Villa, C., Davey, J., Craig, P. J., Drummer, O. H., & Lynnerup, N. (2015). The advantage of CT scans and 3D visualizations in the analysis of three child mummies from the Graeco-Roman Period. *Anthropologischer Anzeiger*, 72(1), 55-65.
- Wade, A. D., & Nelson, A. J. (2013). Evisceration and excerebration in the Egyptian mummification tradition. *Journal of Archaeological Science*, 40(12), 4198-4206.
- Walsh-Haney, H. A. (1999). Sharp-force trauma analysis and the forensic anthropologist: techniques advocated by William R. Maples, Ph. D. *Journal of Forensic Science*, 44(4), 720-723.
- Wedel, V. L., & Galloway, A. (2013). *Broken bones: anthropological analysis of blunt force trauma*. Charles C Thomas Publisher.
- Westheimer, R. K., & Kaplan, S. B. (1992). *Surviving salvation: The Ethiopian Jewish family in transition*. NYU Press.
- White, T. D., Black, M. T., & Folkens, P. A. (2011). *Human osteology*. Academic press.
- White, T. D., & Folkens, P. A. (2005). *The human bone manual*. Academic Press.
- Wieczorek, A., Rosendahl, W., & Reiss-Engelhorn-Museen. (2010). *Mummies of the world*. Munich: Prestel.
- Williams, F. M. (2016). *Understanding Ethiopia: Geology and Scenery*. Springer.
- Yihak, Y. (2012) Debre Libanos of Ham: the ancient and historical monastery. Eritrea Ministry of Information. Retrieved March 15, 2015 from <http://www.shabait.com/about-eritrea/erina/11205-debre-libanos-of-ham-the-ancient-and-historical-monastery>
- Zimmerman, M. R. (2009). *Egyptian mummies and modern science*. Rosalie David (ed.). Cambridge University Press,

## BIOGRAPHICAL SKETCH

Abiyot Debebe Seifu was born in 1979 in Addele Arsi, Ethiopia. As a child, he dreamed of becoming an archaeologist after hearing many reports about the discovery of Lucy's fossil, dating back 3.2 million years. These childhood memories inspired him to become an anthropologist.

Dr. Abiyot has eight years of teaching experience at three universities and two community colleges in Ethiopia. He has participated in numerous committees and field schools in the host institute of Hawassa University (HU). He has a Masters of Art in Archaeology and has received his PhD from the University of Florida. He is passionate about teaching archaeology and conducting archaeological fieldwork.

Dr. Abiyot's complete career experience and academic progress are presented chronologically as follows. In 2001, he began his teaching career immediately after graduating from university in Ethiopia. He taught history courses to undergraduate students at Debub Ethiopia College and worked as a part-time lecturer at Awassa Teachers Training College. He taught for four years and his students were able to teach in various parts of Ethiopia, where formal education faced a staggering shortage of well-trained professionals.

In 2007, he graduated with an MA degree in Archaeology from Addis Ababa University. His thesis was an "Archaeological Survey of Chelba-Tutiti Megalithic site in Gedeo zone, Ethiopia" and was supervised by Dr. Yonas Gebresellassie. He was able to acquire extensive knowledge in archaeology and heritage management.

He joined the Social Science faculty in the Department of Anthropology in 2008 as a lecturer at Hawassa University (HU). While there, he taught undergraduate courses in Archaeological Field Methods, African Archaeology, Ethnoarchaeology, Prehistoric

and Classical Archaeology, Heritage Management and Tourism. He was also an adjunct lecturer for the same courses at Dilla University.

While providing a valuable educational service to his students at HU, Dr. Abiyot actively participated in various committees, specifically: Curriculum Design, Purchasing, Social Science Research Forum and Curriculum Modularization. In addition, he was the coordinator of the Educational Field Trip for two years in the Department of Anthropology. While on the educational field trips organized for different groups to the southern, southwestern and northern part of the country, he witnessed the vulnerability of cultural heritage to both natural and human agents. Most of the archaeological sites in these parts of the country are exposed to erosion and weathering. Moreover, the sites are also affected by rapid expansion of settlement, farming and development projects.

Nevertheless, protecting these and other aspects of Ethiopian cultural heritage is seen as a drag on economic progress and a frivolous pursuit during tough economic times. This is evident when one sees that major construction projects – such as dams, road expansion, towns and mining activities – are given precedence over Cultural Heritage Management (CHM). These development activities absorb billions of dollars from both government and international organizations, yet little of this funding is allocated toward CHM on these projects.

In 2009, Dr. Abiyot undertook collaborative archaeological research on the Tuitti Stele Site with Professor Roger Joussaume. The fieldwork included archaeological excavation, mapping the topography and uprighting fallen steles. Earlier in 2005, as a graduate student, he participated in the Kaffa Archaeological Research Project directed

and codirected by Drs. Hildebrand and Brandt, respectively. He also led anthropology students in archaeological fieldwork.

In 2010, Dr. Abiyot joined the Department of Anthropology at the University of Florida as a doctoral student. He successfully completed the course work and was admitted to Ph.D. candidacy on April 8, 2013. He has received his PhD in Anthropology from University of Florida in 2016.

\