1

Microl

National Library
of Canada

Bibliothèque nationale
du Canada

Canadian Theses Service

Services des thèses canadiennes

Ottawa, Canada
K1A 0N4

CANADIAN THESES

NOTICE

The quality of this microfiche is heavily dependent upon the quality of the original thesis submitted for microfilming. Every effort has been made to ensure the highest quality of reproduction possible.

If pages are missing, contact the university which granted the degree.

Some pages may have indistinct print especially if the original pages were typed with a poor typewriter ribbon or if the university sent us an inferior photocopy.

Previously copyrighted materials (journal articles, published tests, etc.) are not filmed.

Reproduction in full or in part of this film is governed by the Canadian Copyright Act, R.S.C. 1970, c. C-30.

**THIS DISSERTATION
HAS BEEN MICROFILMED
EXACTLY AS RECEIVED**

THÈSES CANADIENNES

AVIS

La qualité de cette microfiche dépend grandement de la qualité de la thèse soumise au microfilmage. Nous avons tout fait pour assurer une qualité supérieure de reproduction.

S'il manque des pages, veuillez communiquer avec l'université qui a conféré le grade.

La qualité d'impression de certaines pages peut laisser à désirer, surtout si les pages originales ont été dactylographiées à l'aide d'un ruban usé ou si l'université nous a fait parvenir une photocopie de qualité inférieure.

Les documents qui font déjà l'objet d'un droit d'auteur (articles de revue, examens publiés, etc.) ne sont pas microfilmés.

La reproduction, même partielle, de ce microfilm est soumise à la Loi canadienne sur le droit d'auteur, SRC 1970, c. C-30.

**LA THÈSE A ÉTÉ
MICROFILMÉE TELLE QUE
NOUS L'AVONS REÇUE**

TOOL AND WEAPON - THE DOUBLE AXE IN THE AEGEAN

An Examination of the Manufacture and Possible Functions of the
Double Axe in the Aegean, prior to 1000 BC

by
© Kathryn A. MacKinnon
Bachelor of Arts, Honours

A Thesis Submitted to
The Faculty of Graduate Studies and Research
In Partial Fulfilment of
The Requirements for the Degree of
Master of Arts

Department of Classics

Carleton University, Ottawa, Ontario
December 15, 1986

© Copyright
1986, Kathryn A. MacKinnon

Permission has been granted to the National Library of Canada to microfilm this thesis and to lend or sell copies of the film.

The author (copyright owner) has reserved other publication rights, and neither the thesis nor extensive extracts from it may be printed or otherwise reproduced without his/her written permission.

L'autorisation a été accordée à la Bibliothèque nationale du Canada de microfilmer cette thèse et de prêter ou de vendre des exemplaires du film.

L'auteur (titulaire du droit d'auteur) se réserve les autres droits de publication; ni la thèse ni de longs extraits de celle-ci ne doivent être imprimés ou autrement reproduits sans son autorisation écrite.

ISBN 0-315-35826-2

The Undersigned Hereby Recommend to
The Faculty of Graduate Studies and Research
Acceptance of the Thesis

TOOL AND WEAPON - THE DOUBLE AXE IN THE AEGEAN

An Examination of the Manufacture and Possible Functions of the
Double Axe in the Aegean, Prior to 1000 BC

Submitted by
Kathryn A. MacKinnon
Bachelor of Arts, Honours

In Partial Fulfilment of the Requirements
for the Degree of Master of Arts

Roland L. Jeffreys
Chairman, Department of Classics

A. Trevor Hodge
Thesis Supervisor

Carleton University

ABSTRACT

Little research has been done on the origin, manufacture and functions of the double axe. Most of the information to be found is speculation on the religious meaning of the axe. This thesis examines its practical aspects.

The origins of the double axe, the reasons for its development and techniques of manufacture are presented, along with an illustrated catalogue of the different types of double axes from the Aegean Bronze Age.

The possible functions are examined under two headings: Tool and Weapon. A variety of sources: archaeological, historical, literary, and modern parallels, are presented in support of the various functions attributed to the double axe.

The conclusion is that while this thesis can serve as a basis for more informed discussion of the religious aspect of the double axe, a complete catalogue and a damage wear analysis of all the double axe finds must be performed before any definite statement can be made.

ACKNOWLEDGEMENTS

I would like to thank Professor Hodge who has been a source of inspiration and guidance throughout the writing of this thesis. I would also like to thank the staff at Interlibrary Loans without whose assistance this thesis could never have been written. Finally, I would like to thank my husband, whose constant support and encouragement all through the research and writing of the thesis made the completion of this paper possible.

TABLE OF CONTENTS

	<u>Page</u>
Abstract.....	iii
Acknowledgements.....	iv
Table of Contents.....	v
List of Figures.....	vi
List of Appendices.....	viii
 Introduction.....	 1
Section I: Origin and Manufacture	
Chapter One: The Double Axe in the Stone Age.....	6
Chapter Two: The Double Axe in the Bronze Age.....	43
Section II: Function	
Chapter Three: The Double Axe as a Tool.....	84
Chapter Four: The Double Axe as a Weapon.....	114
Conclusion	149
Bibliography	154
Figure Accreditations	163
 Appendices:	
Appendix A: Time Charts.....	165
Appendix B: Bronze Age Scripts.....	168
Appendix C: Map of Double Axe Finds	171
Appendix D: Glossary and Axe Diagram.....	173

LIST OF FIGURES

<u>Figure</u>	<u>Description</u>	<u>Page</u>
1a	Stone Hand Axe with Percussion Bulbs.....	8
1b	Side View of Above.....	8
2	Acheulean Hand Axe.....	10
3	Ovate	13
4a	Diagram of Levallois Technique.....	16
4b	Levallois Flake.....	18
5a	Burin/Scraper.....	19
5b	Double Borer.....	19
6	Lyingby Axe.....	24
7	Bone Socket Haft.....	24
8	Mesolithic Axe: Edge Ground.....	26
9	Slot Hafted Axe.....	27
10a	Antler Sleeve Slot-hafted Axe.....	30
10b	Stop Ridge Slot-hafted Axe.....	30
11	Neolithic Polished Axe Head.....	33
12	Withy Hafted Hammer.....	34
13	Knee-haft Axe.....	37
14a	Shaft-hole Tool - Hourglass.....	40
14b	Shaft-hole Tool - Circular.....	40
15a	Splayed Stone Hammer Axe.....	47
15b	Seamed Stone Double Axe.....	47
16	Stone Battle Axes from Troy.....	50

17	Stone Battle Axe from Mallia.....	51
18	Early Copper Smelting Furnace.....	55
19	Shaft Furnace.....	57
20a	Egyptian Flat Axe Head.....	59
20b	Egyptian Flat Axe: Hafted.....	59
21a	Closed Mould - Registration Markings.....	62
21b	Closed Mould - Interior Matrix.....	62
22	Casting Copper in a Bi-Valve Mould.....	64
23	Bronze Casting Furnace.....	69
24	Shaft-hole Grooves.....	73
25	Collared Double Axes.....	73
26	Planking Technique.....	86
27	Modern Hafts.....	88
28	Bronze Age Double Tools.....	90
29	Roman Double Axe Blade Cover.....	93
30	Wedge Axe.....	96
31	Felling Axe.....	96
32	Topping and Lopping Axe.....	98
33	Map of Metal Hoards Found in the Aegean.....	102
34	Late Bronze Age Sarcophagus.....	111
35	Asian Battle Axe.....	116
36	Hammer-buttcd Battle Axe.....	116
37	Egyptian Battle Axe.....	124
38	Saxon Battle Axe.....	128

LIST OF APPENDICES

<u>Appendix</u>	<u>Description</u>	<u>Page</u>
A i	Chronology of the Glaciations and Early Prehistory.....	163
ii	Chronology of the Aegean Bronze Age	164
B i	Aegean Bronze Age Scripts.....	165
ii	Mycenaean Linear B Ideograms.....	166
C	Map of Double Axe Find Areas in the Aegean.....	167
D i	Glossary of Technical or Special Terms.....	168
ii	Parts of the Axe.....	177

INTRODUCTION

Anyone reading casually about, or studying seriously, the prehistory of the Aegean region inevitably comes across some mention or illustration of the double axe. Usually it is in the context of the axe's meaning in the Minoan and/or Mycenaean religion. If any attempt is made, however, to find information on the double axe as a practical implement, the researcher soon finds that what information exists is obscure, often irrelevant and usually out of date. Yet the modern scholars on this period in history do not hesitate to draw conclusions as to the religious and practical use of the double axe in the Bronze Age. For the most part, they do not support their claims and so the most basic and practical aspects of the double axe seem to be mere conjecture. It is my opinion that any conclusions about the axe's religious function are untenable in the light of such a situation. I propose in this thesis to fill the gap existing in our knowledge of the double-bitted axe in order to form a solid basis for any further research on the double axe and its place in Aegean history. The thesis covers material from the prehistory of the Aegean, up to and including the Bronze Age. The functions studied will mainly be those pertaining specifically to the Bronze Age Aegean as that is the age from which the majority of the evidence to be presented originates. The thesis is divided into two sections in order to accomplish the aim stated above. The first is a history of the development and manufacture of the axe and the second an exploration into the possible functions of the double axe.

In Chapter One of the first section, the information on the origins of the single-edged axe, its development and manufacture, gives an understanding of how and why the double axe eventually evolved from this form. The progress of the axe and ideas which anticipated the double axe are traced through the Palaeolithic and Mesolithic Eras up to the actual introduction of the double axe in the Neolithic Age. At this point, with the advent of the first true double axes, and the beginnings of metallurgy, we leave the Stone Age to confront the multitude of evidence with regard to the double axe's manufacture in the metalworking era.

Chapter Two first deals with a controversy over the precedence of stone and metal shaft-hole implements, a subject bearing directly on the importance of the double axe to early man. The development of the double axe in the Chalcolithic era will then be discussed. After a short introduction to copper smelting and casting, the design changes and advantages of the double axe in metal versus stone will be examined.

The transition from Copper to Bronze technology marks the final stage in the evolution of the double axe. It is in the Middle Bronze Age that the axe really comes into its own and as a result there is much evidence to work from with regards to design changes and sophistication. Once again the advantages of this later material are pointed out, this time in relation to the copper double axes. After reviewing the changes in manufacture of the axe and the resulting design alterations we will have concluded the study of the development and manufacture of the double axe.

At the end of this first section is a catalogue of the different types of double axe found in the Aegean from the Late Neolithic to the Late Bronze Age. This catalogue will assist in the exploration of the functions of the double axe to be dealt with in the next section.

Section Two, involving the possible functions of the double axe, has been split into two different categories; the first category is that of Tools and the second is Weapons. This separation is necessary for clarity and also because of the difficulties encountered in the interpretation of the information gathered in each particular chapter.

Chapter Three will cover the functions of the double axe in the Tool Category. The primary function of the axe, its use in woodworking, is covered in some detail due to the vast amount of supporting evidence. The double axe, as used in lumber work, carpentry and shipbuilding, is thoroughly explored and documented, including specific reference to the uses of the different styles as listed in the Type Catalogue provided in Chapter Two. The possible functions of the double axe in relation to masonry and butchering, while not documented as well as the woodworking uses, have a sound backing in other areas of information which are here presented and evaluated. From the exploration of the axe's function as a tool we will turn to consider the use of the double axe in Aegean warfare of the Bronze Age.

Chapter Four covers the most controversial issue in the thesis - the double axe's possible use in Aegean warfare. The chapter begins with an explanation of how the axe is used in war, detailing the advantages and disadvantages of such a weapon. Evidence from the Bronze Age will then be examined in order to determine whether the

peoples of the Aegean could have used and did use the axe as a weapon. This will be accomplished by first reviewing the history of the double axe's use in war by the surrounding civilisations of the Aegean: the Assyrians, Egyptians, North Europeans etc. Then the archaeological evidence, specific to the Aegean Bronze Age, and the problems with its interpretation, are presented. The next step is to examine the literary support for the double axe as a weapon, including Linear B inscriptions and some material from Homer. Finally, the attitudes of the secondary sources, both for and against this possible function of the double axe, are examined in more detail. The great difficulties which arise from these sources and their effects on reaching a conclusion in this matter are all presented in an effort to discover the correct response to the question of the double axe's function in battle.

The conclusion to the thesis follows this chapter and the evidence which has been presented and the conclusions drawn therefrom will be summarised. At this point also suggestions are made for further areas of study relating to the double axe.

It may be noted that while I began my introduction with mention of the double axe in religion, I have nowhere included a discussion of the religious meaning of the double axe. There are two reasons for this deliberate omission.

- 1) Religious importance or ritual use associated with an implement usually arises from the practical function which the object performed (or performs) in its society. Therefore the

religious aspect of the double axe does not enter into the aim of the thesis as stated above.

2) In order to discuss the religious aspect of the axe chapters would have to be devoted to such topics as current and past theories, the double axe in other societies, the Minoan and Mycenaean religions, etc. One M.A. thesis simply cannot contain both a manufacturing/function study and an examination of the axe's religious significance; yet in order to deal with the religious problem accurately and completely, the above described research must be done.

Therefore it is evident that a religious study cannot be done until more is known about the daily use of the axe, and that mention of the worship accorded the axe would not further the presentation of that information. This thesis will then, provide a basis for further study of the double axe in the Aegean Bronze Age.

CHAPTER ONE

THE DEVELOPMENTS IN THE MANUFACTURE AND DESIGN OF THE STONE AGE AXE

In order to understand how the double axe came to be designed and manufactured, it is first necessary to trace the evolution of the simple single-bitted axe.¹ This exploration will help, as well, in the understanding of the terminology used in describing the manufacturing process of the double axe. By following the changes in technology relating to the axe from the Palaeolithic to the Bronze Age, the natural evolution, from the hand axe to the single-edged axe and finally the double-edged axe, will become apparent.

In tracing the evolution of a stone tool, two trends can be identified. The first is that more examples of the tool are found, as well as variations on the basic form, which is an indication of tool specialization. The second is the trend in the manufacture of the tool towards a reduction of waste due to greater forethought and preparation of the stone for specific designs.² The material covered in these two areas overlaps at times, yet it is through identifying such trends that anthropologists are able to trace the evolution of

¹The term "bit" is synonymous with blade. See Appendix D (Glossary), for a more detailed definition of this and other technical terms used throughout the thesis.

²J. Bordaz, Tools of the Old and New Stone Age. (Revised Edition), New York: Natural History Press, 1970, 22.

man through his tools. In fact the different phases in the development of tools gave us not only the broader time designations of Stone, Bronze and Iron Ages but also of smaller time divisions within these larger frameworks.³

The axe was one of early man's first tools. This is shown by the great number of hand axes found in Europe and the Aegean during the Palaeolithic Age. The earliest find of a hand axe in the Aegean area is from Palaeolithic Epirus, ca. 8000 B.C.⁴ Early axes were essential to man's survival and the skills required for fashioning the axes were in great demand. At first prehistoric man would have used as tools the stones he found on a hill or by a stream. Eventually he seems to have realized that certain minerals and natural shapes were better than others for different purposes. Finally the idea evolved of man altering the stone himself and shaping less than ideal pieces to his specific designs.

The first tools were formed by simply banging the proto-tool against another rock surface until the implement was the approximate desired shape. The pieces which flaked off left concave scars known as percussion bulbs (Figures 1a and 1b). These bulbs form the sharp edges and ridges on a hand axe.⁵ The method described above is known as the Abbevillian technique, and is the

³See Appendix A for a complete time chart.

⁴E.S. Higgs, "The Stone Industries of Greece," La Préhistoire: Problèmes et Tendances, Paris: Editions du Centre National de la Recherche Scientifique, 1968, 228.

⁵W. Watson, Flint Implements, London: Trustees of the British Museum, 1950, 30.

Figure 1a
Abbevillian Hand Axe.

Figure 1b
Detail of Above Showing Percussion Bulbs

earliest identified stage in the formation of tools (ca. 500,000 B.C.).⁶ It is a method with no real control over the exact placement or strength of the blow. For this reason the percussion bulbs formed are large and the edges of the tool are heavy and blunt, while the ridges formed prevent any sort of depth in a cut. But as the axe was an all purpose tool, used to ". . . cut, sever, bruise and break" there was, at this stage, little need of a finely worked tool.⁷

The next stage in the evolution of the axe was for the toolmaker to try to gain more control over the formation of the edge and the size of the bulb ridges. For this purpose a system of indirect percussion was developed, known as knapping. This involved the toolmaker sitting with a large stone, called the core, between his knees. He would then take a smaller stone, called a striker, and by careful placing of the blows remove small, precise flakes from the core. At least this is the theory behind what is known as the Acheulean technique, which first appeared 480,000 years ago (Figure 2). Achieving the ideal results would require much practice and great skill. At its best this method produces much shallower bulbs of percussion, the direct benefit of which is a smoother surface for a slightly deeper cut.⁸ In its earliest stages, however, this technique would produce tools only marginally better than those made by the

⁶The various names for the manufacturing techniques come from the areas (in France for the most part) where they were first identified.

⁷G. MacCurdy, "The Cult of the Axe," Holmes Anniversary Volume, New York: AMS Press Inc., 1977, 301.

⁸Watson, 34-5.

Figure 2
Acheulean Hand Axe

Abbevillian technique. Therefore, it is not for quite some time after the Middle Palaeolithic Age that tool specialization begins.

There is, of course, no clear cut line which would denote the start or finish of either of the above techniques. The Abbevillian was used throughout the Stone Age, as was the Acheulean. The reason for the great difference in time and for some ideas dying out while others continue for thousands of years, was the changing physical condition of the earth during these periods in time. As each successive glaciation advanced and retreated, some terrain and people were wiped out while other forms and cultures made their first appearances. There is, though, an order of precedence chronologically. At some time, between the development of the two above methods, primitive man began to consider more carefully the stone or bone he was using. This thought given directly to his material affected the development of the Acheulean technique. From the numerous finds by anthropologists it is known that for tool making, while different materials were used, such as obsidian or quartz, flint becomes, at this time, the most popular.⁹ This is because flint combines, in the one mineral, three factors necessary for the best results in stone knapping. Two of these factors are homogeneity and a small grain structure. When a knapper strikes a mineral with a small grains the fracture can be controlled because the size of the grains only allows the fracture to travel a small distance. The homogeneity ensures that the fracture will break along

⁹K.P. Oakley, Man the Tool-Maker, (Revised Edition), London: The Trustees of the British Museum, 1961, 17-18.

a plane surface and not ~~just~~ split the stone haphazardly.¹⁰ But while these two qualities are common in many minerals most of these minerals are weakly bonded, such as sandstone, and while such a substance can be easily shaped it will not hold an edge or stand up to use as a tool. Flint, however, has both the above qualities and it is a hard mineral. An edge produced in flint is very sharp and durable, well suited to the hand axe's functions as hoe, shovel, club, grinder, scraper, skinner, etc. Flint then, quickly took over as the dominant mineral used in stone tool knapping.

This exploration in the use of flint also resulted in a new group of "multi-edged" implements called "ovates". These tools had sharpened edges around their whole circumference and anthropologists believe that they were some sort of projectile weapons (Figure 3).¹¹ In using this weapon the hunter would have a strip of leather protecting his hand and taking up an ovate he would hurl it at an animal. The hand axe was not, at this time, used as a weapon. All weapons from the Palaeolithic age involved putting distance between the hunter and the hunted. Clubs, wooden or bone, slings, spears (jabbing, not throwing) all kept the hunter at least an

¹⁰Watson, 28.

¹¹Watson, 35.

Figure 3

Ovate

arm's length away from his quarry. Not until the axe is hafted can it be considered a true weapon.¹²

Throughout the Lower Palaeolithic the trend in tools was towards specialization. After the identification of flint as the best material, there was a gradual improvement in the manufacturing technique. Softer strikers, such as bone or wood, were used and the knappers became adept at decreasing the number of flakes taken off in order to arrive at the desired shape. Other factors, such as careful choice of the core specimen, as well as a more accurate plan of the blows, could mean a difference in hours in the production of the tool. By the beginning of the Middle Palaeolithic era, four classes of tools have emerged:

1. Tools moved along the axis of their working edge.
(longitudinally/vertical plane) e.g. Knives, saws.
2. Tools worked perpendicular to the axis of the working edge.
(transversely/horizontal plane) e.g. Scrapers, chisels.
3. Tools used to perforate.
e.g. Borers, needles.¹³
4. Percussive Tools.

¹² By 'true weapon' I mean an implement that was created with the express purpose of hunting in mind, as opposed to an implement with the potential for use as a weapon. e.g. A woman cleaning an animal skin and is attacked by a scavenger. She could hit it over the head with her hand axe. All implements have the potential for weapon use, but in the study of function we wish to know which ones were created with hunting or defense specifically in mind.

¹³ These were most often made out of bone or wood as stone has still too thick an edge to perforate animal leather at this stage.

e.g. Cleavers, hand axes, hammers, choppers.¹⁴

Up to this point the manufacturing techniques described relate to all the tools made out of stone, the most important being the hand axe. In the Middle Palaeolithic era, however, with definite tool specialization in evidence, we may now concentrate specifically on the development of the axe in its category as a percussive tool.

The next advance in manufacturing which affects the axe, resulted from the above mentioned preparation of the core. As shaping of the core became more and more exact, man found that the flakes he was chipping off could also be useful. Throughout the Middle Palaeolithic era the knapper concentrated increasingly upon the flakes, until core tools are superseded. This new method of tool making, known as the Levallois technique, is described in more detail as follows:

In this stone-knapping technique, which appeared . . . about 200,000 years ago, the nodule [core] is prepared by careful flaking before the removal of a [tool] flake (Figure 4a). . . This preliminary flaking of the outline and top of the nucleus determines a great variety of shapes. . . With this method, the size and shape of the tool can be predetermined, as in the case of the core tools, and in addition, the knapper can obtain smoothly tapered, very sharp edged flake tools with ease.¹⁵

Three or four blades could be taken from a single "discoid" core, (a description of the shape of the prepared core) using the

¹⁴Bordaz, 42-44.

¹⁵Bordaz, 31.

Figure 4a
Levallois Stone Knapping Technique

above method (Figure 4b). This means a greater number of tools can be made using less material. These blades are still hand held. There is no need for chopping down trees (a function which would call for a stronger blade and the greater leverage afforded by a haft) as this is the middle of the Würm glaciation period and there are no forests on the continent.

The chief advancement in stone tool manufacture during the Upper Palaeolithic era does not affect the axe blade. It involves the preparation of a truncated (versus discoid) core which results in thin, sharp, pointed blades, such as are used for burins, awls and knives.¹⁶ A minor technique, however, developed during this period, which does relate to the axe. There is some evidence which suggests that flint was deliberately heated and cooled to strengthen the edge of the blade.¹⁷ With this exception though, the manufacture of the axe remains essentially the same to the end of the Palaeolithic period.

There does appear at this time though, a new type of tool which is a direct precursor to the double axe. This was known as a "double" tool and had either two separate functions or twice the same function on the one implement.¹⁸ The burin scraper (Figure 5a) and the double borer (Figure 5b) are two examples of this type of tool. Once hafted these became the more advanced double tools such as the double axe, hammer-bitted axe, pick axe etc. It is in the Mesolithic era, which signals the end of the ice ages, that the technical advance of hafting is discovered. This is the most

¹⁶Bordaz, 51 ff.

¹⁷Bordaz, 86.

¹⁸Bordaz, 72.

Figure 4b
Levallois Blade

Figure 5a
Burin (top) Scraper (bottom)

Figure 5b
Double Borer

significant development in the history of the axe and the subsequent introduction of the double axe.

The Mesolithic era is an intermission period in history. The primitive peoples of this time were partly nomadic, gradually changing to a more settled way of life. Gatherers progressed to agriculture and hunters to the domestication of animals. These changes in lifestyle and the concurrent changes in tools and their manufacture, all came about because of the changing physical landscape.¹⁹ The retreat of the last glacier left Europe, previously a large, flat expanse of land, covered in heavy forest. There were no longer huge herds roaming the plain, instead the forest was populated by smaller mammals such as deer, fox and wild swine. These animals are much more difficult to track than herds of beasts, especially through the forest. Adapting to this type of hunting resulted in the domestication of dogs and a change in weapon preference. Instead of heavy spears needed to keep distance yet strike down a huge opponent, a lighter and quicker missile, such as the bow and arrow, became the dominant weapon. Of course, to move through the forest, to build shelters and to feed fire, forestry clearance had to begin as well. The axe, as it was produced in the Palaeolithic period, could not perform these tasks. Hafting was a natural and necessary development.

Before discussing the introduction of hafting and the resulting changes in the axe head, it is important to understand that while the developments will be related in chronological order, they do not

¹⁹Johannes Iverson, "Forest Clearance in the Stone Age," Scientific American, March 1956, Vol. 194, 36-41.

necessarily evolve as result of a previous technique. They can, and often do, come about independently. In fact, all the forms and techniques already mentioned did not simply die out. There were areas such as Africa, and even parts of the Mediterranean, which were not changed greatly by the withdrawal of the glaciers and kept their older ways of tool making and of living. Therefore while the hand axe will no longer be discussed, it was still in use in different parts of the world, even up to the Iron Age.

The obvious need facing the Mesolithic people was the ability to clear and use the increased number of trees and brush which had arisen after the retreat of the Würm glacier. The hand axe, minimally effective in chopping small brush or saplings, was ineffective for this heavier work.²⁰ Simply swinging harder was not enough. No matter how dogged the attempt, felling even small trees would still take too long to be of any practical use. This was because the hand axe used bruising more than cutting to make its way through the object under work. In addition, the shocks to the hands and arms would have been considerable. Eventually man realised hafting was the answer to his problem but where did the idea come from? There has been much speculation on this, but the most likely explanation is that a Mesolithic man simply picked up a bone after eating his dinner and swung it a few times, noting its effectiveness.²¹ This theory is especially favored as the earliest type of "hafted" axe

²⁰H.H. Coghlan, "The Evolution of the Axe from Prehistoric to Roman Times," The Journal of the Royal Anthropological Institute, 1943, Vol. 73, 27.

²¹For the other, less favored ideas, see Bordaz, 89 ff.

found, is of antler bone and is known as the Lyngby Axe.²² It is a whole axe, complete in one unit, not a separate head and shaft (Figure 6).²³ For hafting did not first come about as a result of primitive man suddenly tying a hand axe to a stick, but originated more from the club, as a whole unit, and only later did the idea of attaching a stone edge to an organic handle come about. This type of axe represents only a marginal improvement over the hand axe, however, as it was restricted to trimming off branches and cutting down light brush.²⁴ It is mentioned here as an indication of the beginnings of the idea of the hafted axe. From this idea would come stronger tools capable of handling the tasks of the Mesolithic environment. The antler axe did not age well, as bone gets brittle and fragile with exposure to air. While it was a step up from chopping with a hand tool, there are inherent faults and problems with this type of axe, as stated by Coghlan:

(1) The handle is heavier than the head . . . preventing any proper balance in the tool and greatly reducing the impact value of the blow delivered, besides increasing the shock transmitted to the handle, which would probably cause an early failure of this part.

(2) The distance from the cutting edge to the axis of the handle shaft is too great, thus rendering the tool unnecessarily clumsy to manipulate. . . . [one must] realize what a serious disadvantage bad proportioning, combined with lack of proper head balance, would be.

²²Coghlan, 30.

²³Coghlan, 31. The axe is dated to circa 8000 B.C.

²⁴Coghlan, 30.

(3) The cutting edge is formed from a roughly circular, or elliptical, member, necessarily of small diameter. It is obvious that this limits the size of the cutting edge so much that only light work could have been performed.

(4) The hollow centre of the bone renders it impossible to form a correct cutting edge; the best that could have been obtained was a sort of gouge-axe style of cutting face, but it would be weak and inefficient. True penetration, as achieved by a correctly designed axe, could not possibly have been obtained.²⁵

The antler axe seems to have been used, alongside the hand axe, until about 7000 B.C. Around that time the bone handle, which is hollow, became a socket and haft for a stone head. The browline of the antler, which had previously served as the blade, was hollowed out and a stone head was wedged in its place (Figure 7). This is known as a socket haft.²⁶

In the Mesolithic Age the changes to the head of the axe, although seemingly minor, are very important and directly related to the developments of hafting. In identifying the need for a heavier tool it was recognised that a larger axe head would penetrate deeper into the wood, but the increase in size was awkward to handle (top-heavy) and difficult to haft. Therefore, a way to improve the depth without adding to the weight of the implement had to be found. The

²⁵Coghlan, 32.

²⁶Coghlan, 38.

Figure 6
Lyngby Axe

Figure 7
Socket Haft

axe head, which had simply been tapered before to give a finer edge, was now polished along the edge of the blade. This was accomplished by rubbing the blade edge against gritty rock, such as sandstone. Then, holding it in his lap, the tool-maker took a small, fine-grained stone with sand as an abrasive and "polished" the edge until it was extremely smooth (Figure 8). This new method of preparing the blade eliminated the ridges caused by flaking and enabled a smoother and deeper cut with actually a slight reduction in weight.²⁷ The axe head would not have been too much lighter, however, because weight was important for power. The smoothness mentioned above was essential because when the thickness of the edge was reduced there was greater chance of breakage. But a polished, symmetrical edge can withstand the force of a blow better even than a slightly thicker, rough edge, due to the equal distribution of pressure over a smooth, uniform surface.²⁸ The earliest tools with this type of ground edge found in the Aegean are from Crete, dated ca. 4000 B.C.²⁹ While this development in the manufacture of the blade was to be improved upon in the Neolithic Age, hafting methods changed and evolved more quickly. The next step, still in the Mesolithic Age, was that the bone socket haft gave way to the use of a wooden handle with a slot cut in at one end (Figure 9).³⁰ This method is known as the slot-haft and it quickly replaced the socket haft technique. Before going into more detail on this new development in hafting, however, it would be beneficial first to

²⁷Bordaz, 93.

²⁸Bordaz, 99.

²⁹Bordaz, 42.

³⁰Bordaz, 102.

Figure 8

Mesolithic Axe Head - Ground Cutting Edge

Figure 9
Slot-hafted Axes

describe the characteristics of the haft in general, as it plays an essential role in the development of the double axe.

As a material for hafts, wood replaced bone in a very short time because it was tougher, more durable and the tool-maker had a much wider range of options in shaping the handle. The wood used, though, had to be some sort of hard wood because carving the end of the handle and the insertion and use of the axe head put a great deal of stress upon the material.³¹ A soft wooden haft tended to split almost immediately. The most popular wood used seem to have been from the ash, oak and olive trees.

The length and weight of the handle was, as in the case of the manufacture of the axe head, a matter of compromise. While a heavier haft would last longer, it was much harder to balance and very tiring to use. And while a longer handle would transmit more power from the shoulders to the blow, in the case of this method of hafting, it would result in too much power. This was undesirable for two reasons. The first is that with a very heavy blow the axe head could be driven through even a hardwood handle. The second is that great power and skill were required to place accurately a blow using a long handle. This is a complicated manoeuvre which will be fully described in the section on the function and use of the axe. A shorter handle, two to three feet in the Mesolithic Age, was easier to manipulate and due to lack of force imparted it also lessened the problem of the slot hafted axe head being driven through the shaft. Accurate placement of the blows however, was still very important. A study was published by Anthony Harding and Robert Young, in

³¹Bordaz, 100.

which they describe the results of their making Mesolithic slot-hafted axes in the manner described above and their attempts to use these axes on a number of different tree types and sizes.

Harding and Young discovered that if the blow was not hit at an accurate acute angle to the tree, the axe head could loosen and the haft shatter and split.³² The blow had to come from the elbows and not the shoulders, with the handle of the axe being no longer than two to three feet. In their inexperience they went through quite a number of axes before being able to ascertain the times and methods for cutting down trees.³³

J. Iverson, describing a similar study done in Scandinavia, reported that the experimentors found if they "chipped with short quick strokes, using mainly the elbow and the wrists" the rate at which the axes broke was reduced to almost nil.³⁴ Using this system Iverson found that a tree one foot in diameter could be cut down (after much practice) in approximately thirty minutes.³⁵

Primitive man did not, however, simply give up and accept the compromise that he could not use as much power, but instead went about trying to find solutions to the problem of the power versus breakage problem. The first solution was to combine old technology with the new. A sleeve of bone (usually antler) was cut to fit inside the slot and around the stone head (Figure 10a). This sleeve

³²A. Harding and R. Young, "The Hafting Methods and Functions of Stone Implements," Stone Axe Studies, Editors: T.H. McK Clough and W.A. Cummins, London: Council for British Archaeology, 1979, Research Report Number 23,104.

³³Harding and Young, 103.

³⁴Iverson, 38.

³⁵Iverson, 38.

Figure 10a

Antler Sleeve around Axe Head

Figure 10b

Socket-hafted Axe with Antler Sleeve and Stop Ridge

absorbed much of the shock and resulted in the wooden handle lasting much longer. There was still the problem though, of driving the axe heads through the shaft with particularly forceful blows. The incidence of this was decreased by creating a stop ridge around the antler socket.³⁶ This held the flint axe head away from the wood and made it almost impossible for the head to break the handle (Figure 10b). These changes did, however, add weight to the axe and the slot-hafted axe was a bit clumsy and sometimes tiring to use.³⁷ This system of hafting was, however, easy to create and repair and was dominant throughout the Mesolithic Age. There are no double-edged tools in this style, as any attempt to ~~swatch~~ ^{swatch} sides would result in the stone head being thrust out of the slot. Harding and Young, in their study, both feel that the added balance and solidity of the double axe head would have resulted in a tool which was more, durable and easier to swing, albeit heavy.³⁸ The image, however, of the butt end of the blade protruding from the back end of the slot would have kept the idea of the double tool in the mind of the wielder and may have led to the next step in the evolution of the axe, which also introduces the first double axes.³⁹ This change takes place in the Late Mesolithic and Early Neolithic and marks another major development in the design of the axe.

The Neolithic Age came about at different times in different areas of the ancient world, unlike the Mesolithic which followed a

³⁶Coghlan, 37.

³⁷Coghlan, 38.

³⁸Harding and Young, 104.

³⁹See Appendix D ii for a diagram of the parts of the axe.

specific geological change. In fact the Mesolithic era is really a "between" term used to describe cultures post-glacial and pre-Neolithic. Some cultures moved directly into the Neolithic Age with little or no Mesolithic period because their physical environment did not go through the major changes as did Europe's. The change in tool making technology which gives this period the name "Neolithic" was the shaping of tools by polishing, rather than simply striking a blade and then retouching it slightly. The whole blade is now finely polished, much in the same way that the Mesolithic edges were prepared, but this time, in the final stages, the tool-maker used wetted sand rather than dry, producing an even smoother finish over the whole implement (Figure 11).⁴⁰ Broken tools were now often repaired and used again for a different task, as opposed to starting all over with a new blank. There now begin to appear various forms of the axe, each to suit a specific set of tasks.⁴¹

Hafting advanced considerably in the Neolithic Age. A minor technique used at the beginning of this period was the Withy hafting method. This involved placing a large stone head, with ground grooves, between a flexible stick bent in two (Figure 12). This was not a very effective method of hafting as the flexibility that made the haft possible resulted in a weak, ineffectual and uncontrollable swing. This method was suited only for hammers rather than an axe. For, unlike the axe, the hammer head was usually so large that it

⁴⁰This type of finish on the blade opened up a wider variety of stone for the use of the tool-maker. This was because huge percussion ridges, created by knapping minerals with large grains, could now be polished away in the final stages of the tool-making process.

⁴¹Coghlan, 35.

Figure 11
Neolithic Polished Axe Head

Figure 12
Withy Hafted Hammer

remained in one piece regardless of where the head struck the object or how hard it hit. I mention this method in order to illustrate the first hafted double tool known from this time. The attempt to haft a double tool testifies to the fact that the idea was still important to early man. There is the added factor in dealing with manufacturing and design advances in the Neolithic Age that it is from this period that the first evidence of metal working is found.

In Egypt the Neolithic era came earlier than in Europe and the Mediterranean. It has been postulated that climate as well as the hardest trees known at the time both had something to do with the Egyptian's accelerated technological growth in relation to the axe. In the Faiyum period (Old Kingdom) anthropologists have identified one of the earliest flint and chert (an igneous rock) industries.⁴² It is possibly due to the hardness of the tamarisk tree that the Egyptians were driven to devise a better function-form ratio for the axe which would involve both fewer breakages and swifter, more efficient cutting. Other cultures were limited, as previously mentioned, to cutting small light saplings or larger very soft wood with their available tools.⁴³

The Egyptians' improved method of hafting developed in recognition of the fact that the axe head has to be narrow to bite deeply and effectively into hard wood and large trees. With the older axes, the blade would have dulled and broken long before the tree could be cut down. A method had to be devised that entailed

⁴²Coghan, 35.

⁴³Charles M. Keller, "The Development of Edge Damage Patterns on Stone Tools," Man. (New Series) Vol.1, No. 4, 1966, 509.

strength, without the bulk or the haft-splitting problem of the slot-haft. The new method is known as the knee-haft mount. It involved fastening a flat, rectangular (narrow) polished blade to a suitable shaft which had a root or branch sticking out at a right angle to the main stem, creating an implement resembling a very strong antler axe.⁴⁴ The stone would be attached by tying it to the outcrop which had been left for this purpose (Figure 13). This was an important step because it forced the study and improvement of the narrow blade as this system is useless for thick, bulbous blades. This resulted in rectangular blades, long but thin. The length kept the weight up while the narrowness produced deeper penetration and an easier, quicker retrieval of the blade from the cut. In addition, the rate of handle breakage was lowered as the stress was absorbed by the attaching rope rather than having all of it transmitted to the haft. Another reason the knee-haft method is so important is clearly stated by H.H. Coghlan:

The device furnished a method of mounting the axe by which it was correctly balanced in relation to the handle, permitting full use to be made of the kinetic energy imparted to the tool. A much greater amount of useful work could now be performed for a given expenditure of energy on the part of the operator than was the case with less efficiently hafted axes.⁴⁵

⁴⁴Coghlan, 36.

⁴⁵Coghlan, 36.

Figure 13
Knee-hafted Axes

While this hafting method resulted in far fewer handles splitting and gave a better ability to place the blows accurately it also had some liabilities. The main one was that a tool is only as strong as its weakest point, in this case the cord used to fasten the blade to the shaft. This would have to be replaced often and, if it worked loose during a cutting operation, could prove dangerous to the user. Because of this method of attachment, the blade was not too secure when levered out of the cut. That is, after the swing and connection with the wood one must lever the axe out of the cut. This is usually done by rocking the axe back and forth until it comes loose. This, though, loosens the ties of the knee-shaft.

Once again the double axe would be the answer to many of the problems presented here - or more specifically, the double axe hafted in an effective manner. But how can one haft a tool in such a way that both sides of the blade can be used? The answer lies not in the haft but in the blade itself. This switch in focus, from the shaft to the axe head, resulted in the most important development in the making of the axe and in the introduction of the double axe. Instead of drilling a hole in the shaft, the hole was drilled into the stone head in order that the shaft might be placed within it. This is known as the shaft-hole technique and first appears around 5000 B.C. in Mesopotamia. By 4000 B.C. this technique had spread all over the Aegean.⁴⁶ It is significant to note that among the first tools found hafted in this method is the double axe.⁴⁷ So why then, if the double

⁴⁶ V.G. Childe, "Eurasian Shaft-hole Axes," Eurasia Septentrionalis Antiqua, 1964, Minns Vol. 9, 159 and 162.

⁴⁷ V.G. Childe, New Light on the Most Ancient Near East, London: Kegan Paul, Trench, Trubner and Co., Ltd., 1934, 258-59.

axe is the answer to all the above problems and it can now be made, does it not appear in huge numbers and phase out all other forms of axes at this point? The answer lies partially in the difficulty of drilling the hole into the stone head. Drilling such a hole is rather like grinding, but only in one specific spot. The tool-maker would use sand and water along with a wooden stake. He would rotate this, possibly with the help of a bow. Coghlan best explains the complicated process:

A hole cannot, it is true, be drilled by means of a solid round wooden stick and abrasive unless a secondary process be resorted to; and although a piece of wood of a suitable quality would serve, with very frequent cleaning, as a carrier for the grinding medium, it could not drill a hole because there would be no drilling (or rather grinding) action at the centre of the drill. Hence, to grind out a hole by this method it would be necessary continuously to chip out a lead for the drill, . . . Chipping out such a lead would clearly not be easy, and it would become progressively more difficult as the depth of the bore increased; . . . the practicable depth of the hole which could be bored would always be less than the diameter of the bore.⁴⁸

The holes formed by this method are an hourglass shape (Figure 14a). This is due to inadvertent side grinding as the hole gets deeper. It is an hour glass shape and not a deep "V" because, as outlined above, the depth problem would force the borer to turn the stone over halfway and start again from the other side.

⁴⁸Coghlan, 48.

Figure 14a

Shaft-hole Tool - "Hourglass" Hole

Figure 14b

Shaft-hole Tool - Circular Hole

There was another method which was slightly more efficient than the above, but it was restricted to countries where the material needed was available. It called for a sturdy hollow reed. Once again using sand as an abrasive "a central core would be cut out" by rotating the reed on the stone. This would save the tool-maker from having to reduce the whole plug to dust (Figure 14b).⁴⁹

Because of the labor and difficulty of drilling the shaft-hole one would think it would not often be used, yet there are many stone shaft-hole finds from the Late Neolithic Age. This could be due to the influence of the metal shaft-hole implements which begin to appear in this period. It is obviously far easier to cast a central hole in metal than to drill one in stone. As metal technology was quite restricted at this early date it is possible that those people without such a technology but who were exposed to it, attempted to "imitate" the metal tools in the only material they had available - stone. The question then arises, "Were there any shaft-hole implements before those that appear in metal or are all the stone tools mere imitations of metal originals"? This question, which is an ongoing controversy, will be discussed in the next chapter as it does affect information about the metallic double-axe. The double axe has the perfect natural axe head for the shaft-hole method of hafting. Because "In stone and antler a substantial thickness of material must be left all round the shaft-hole or the implement will split in boring; hence the shaft-hole cannot be right at the butt."⁵⁰ It is obvious, then, how the double axe evolved. As already pointed out, the idea of a double tool

⁴⁹Coghlan, 48.

⁵⁰Childe, "Eurasian Shaft-hole Axes", 158.

had been around in proto-forms since the Paleolithic era. It would not take a great leap for the stone carver to realise that if he sharpened the knob left over after he had bored the hole in the middle of a blade, that he'd have a balanced tool which would be strong and last twice as long as a single-edged axe. It is in stone that the first double axes are found in Crete around 4000 B.C. They are quite prolific all over the Aegean and Eastern Asian regions. While more details on the advantages and disadvantages of the shaft-hole hafting technique will be dealt with in Chapter Two, it is here that the story of the lithic axe head, both single and double, ends. It is the double axe head in its metallic forms which takes over now, to the point where stone is almost never used.

We have seen then, the progress of first the hand axe, from crude tool to its stages of core shaping and flaking. The technique of hafting resulted in a whole new direction for the stone axe head. Hafting methods then developed and caused changes culminating in the double axe. In many cases it can be clearly seen that need was the mother of invention. As the climate and geography changed the elements and skills needed for man to survive, so did the technology of the axe change and evolve until the double axe could be practically hafted. The introduction of a new material, copper, for the axe head, would have repercussions both in the area of hafting and use of the axe in general, but from this time, until the introduction of iron, the double axe would be the favored implement applied to tasks requiring almost any form of axe.

CHAPTER TWO

THE MANUFACTURE AND DESIGN OF THE DOUBLE AXE IN THE BRONZE AGE

The transition from stone to metal technology effected great changes in the double axe, as it did in almost all areas of prehistoric life. This transition did not, however, occur at the same time in all regions, but seems to have originated in a few individual centres and then spread out to other areas through trade and conflict.

It has been definitely established in the last twelve years, that metal working in the Aegean began in the final stages of the Neolithic period, as it did in fact, all over Europe, the Mediterranean and Eastern Asia.¹ This is often not realised and the terminology used for distinctions within the Bronze Age can be confusing. While the lithic ages are defined by a change in the tool making process and the Bronze Age gets its name from the change in material used to make the tools, the terms Early, Middle and Late when applied to the Bronze Age refer to developments in pottery techniques, not tool making. The reason is, of course, that the number of pottery fragments showing different styles and techniques are far better dating indicators than the metal finds. Between the Neolithic and the Early Bronze Age another, shorter, time span has been identified as

¹Colin Renfrew, The Emergence of Civilisation: The Cyclades and the Aegean in the Third Millennium B.C. London: Methuen and Co., Ltd., 1972, 311.

the Chalcolithic period. It is a transitional period, when the first cast metal, copper, is being experimented with in small ways, but stone is still by far the dominant material in tool making. So then, between 4000 and 3500 B.C., in the Aegean Chalcolithic Era, the first metal objects begin to appear.

There are still arguments about whether or not metal working developed independently in the Aegean or whether it was introduced from either the Balkans or Anatolia.² But in relation to the study of the double axe it is not so important how metal working came about as when. The reason for this was briefly touched on in the previous chapter: the controversy over whether the shaft-hole tools, and therefore the double axe, were made and used in stone before the emergence of metallic versions of the same implements. The purpose of pursuing this problem is not simply to set a date for the earliest use of the double-bitted axe. The answer will help to trace the development of the idea of the double axe and the reason why it did not dominate the toolmaking industry when it was first introduced in stone but seems to have sprung into "sudden" prominence once metal work is widespread.

Caterina Mavriyannaki, writing in 1983, states clearly at the beginning of her paper that:

Les doubles haches réelles, c'est-à-dire à deux tranchants parallèles et aigus, apparaissent, semble-t-il, seulement lorsque les métaux

²Renfrew, The Emergence of Civilisation, 311 ff.

commencent à être connus

But she gives no support for her position and does not seem to have considered fully the conflicting evidence which presents itself when one looks over all the stone double axe finds.

The first issue to be dealt with in this problem is whether or not man had the technology to produce a shaft-hole implement before metal work had been introduced. The answer by all researchers in the field is in the affirmative.

The distribution of the prerequisite technical skill was . . . enormously wider both in time and space than that of its application to the axe. The Aurignacian and Magdalenian *bâtons de commandement*, stone disks from Brno and Predmost and probably certain stone maceheads from North Africa illustrate perforation in palaeolithic times.⁴

Early man then, did have the technology needed to make the shaft-hole in stone long before the beginnings of metallurgy.⁵ However, the problem arises that most of the few such implements found, dated to the late Neolithic Period, have features that can only be identified as imitative of their supposedly "later" counterparts in

³C. Mavriyannaki, "La Double Hache Dans le Monde Hellénique à L'Age du Bronze," Revue Archéologique, 1983, Vol. 2, 197.

⁴V. Gordon Childe, "Eurasian Shaft-hole Axes" Eurasia Septentrionalis Antiqua, 1934, Minns Vol. 9, 158.

⁵The perforated mace heads mentioned by G. Childe in the above quotation are classified as ancestors of the stone shaft-hole tools, as are the perforated antler axes, because they do not seem to have been hafted in any way. But they do show that man could, at that time, long before the introduction of metal work, perforate both bone and stone.

metal. Figure 15a is an excellent example of this type of hybrid axe. The cutting edges of this axe are splayed. This is a condition which, in copper, results from the necessity of hammering the blades to produce a sharp edge. It has no function in stone.⁶ Figure 15b is another example; this time the axe has a centre seam. In copper casting, a seam is left which represents the separation line of a two-piece mould. But there is absolutely no functional reason for the toolmaker, working in stone, to have included such a seam.⁷ The answer then, to the problem seems obvious: if there are no stone shaft-hole tools which do not imitate the metal shaft-hole implements, then obviously the metal ones must be the originals. There are, however, a very few possible shaft-hole tools which do not exhibit later metal characteristics, but over these scholars disagree.⁸ Added to this problem is the fact that if the shaft-hole axes and other tools could be and were made before metal tools, there should be more of them. As outlined in Chapter One the shaft-hole method is by far the superior technique of hafting an implement. The popularity of the metal shaft-hole tools later on supports this point. Why, if they did exist, do not more stone double axes appear, in the Neolithic times and earlier, which are not simply imitations of metallic tools? Even Childe, who feels that some of the axes found may have ante-dated the metal tools, in referring to

⁶H.H. Coghlan, "The Evolution of the Axe from Prehistoric to Roman Times," The Journal of the Royal Anthropological Institute, 1943, Vol. 73, 49.

⁷Coghlan, 49.

⁸Childe, "Eurasian Shaft-hole Axes," 159.

Figure 15a
Splayed Stone Axe Hammer

Figure 15b
Seamed Stone Double Axe

these axes says: "[they]...must have been rare...since very few have found their way into museums whether in Baghdad or Europe".⁹ How can this be so if the double axe was the ideal tool and later favored weapon of at least one culture?¹⁰ Coghlan has come up with a few possible reasons why, even though the technological ability was present, stone shaft-hole tools were not as popular as those in metal

Owing to the low tensile strength of stone, the shaft-hole is always a source of weakness. The tensile stress in the material, caused by wedging the shaft firmly into its hole, when combined with the shock-loading set up when the axe is in use, is always likely to break the axe through the shaft-hole; and the axe which had cost so much time and labour to make may break after the first few blows . . . It is not until the metal shaft-hole axe became general that a really reliable and efficient tool was available to carry out the heaviest work.¹¹

If Coghlan is correct, however, why would any stone shaft-hole tools, especially ones for "heavy work" such as the double axe, be made at all? The first reason, as touched on in the previous chapter, is that while many cultures would have been exposed to metal implements through trade or conflict, this does not mean they had the technology to reproduce these tools. So they might imitate what

⁹Childe, "Eurasian Shaft-hole Axes," 159.

¹⁰The "battle axe" cultures were spread all over Northern Europe in the Late Neolithic and Early Bronze Ages. For more information see V.G. Childe, The Danube in Prehistory, Oxford: At the Clarendon Press, 1929; C.F.C. Hawkes, "The Double Axe in Prehistoric Europe", Annual of the British School at Athens, 1936-37, Vol. 36, 141-159.

¹¹Coghlan, 50.

would seem a superior tool, in the best material they have available - stone. It would quickly become apparent that such a tool in stone was not all that useful, for the reasons stated above, and that is why so few were made. While this explains the majority of stone shaft-hole tools found up to this point, it does not explain those stone double axes and the like which are found in cultures that we know had metal working ability at the time that the stone axe was made; Childe cites "abundant" perforated battle axes found at Troy II and some from Lesbos.¹² The answer lies in the careful preparation and polishing of the weapon. Coghlan feels that:

... the possession of a weapon on the production of which a more than ordinary amount of labour had been bestowed was probably regarded as a mark of distinction.¹³

This theory is supported by the beautiful ceremonial double axes found at Troy, some made of precious stone, others too small to have been used in battle (Figure 16). Also, one battle axe, discovered at Mallia, on Crete, is artfully executed in the shape of a leopard (Figure 17).

After reviewing all the conflicting factors in this problem of precedence, Caterina Mavriyannaki's statement can be taken as accurate in a broad sense. The technology was present for shaft-hole tools before the metal ages and it seems to have been used to make stone tools. But these were produced in very limited numbers due to the inherent weakness in combining this hafting method with stone.

¹²Childe, "Eurasian Shaft-hole Axes," 162.

¹³Coghlan, 50.

Figure 16
Battle Axes from Troy

Figure 17
Stone Battle Axe from Mallia (Crete)

This then explains why the double axe, the ideal tool for the Neolithic man, was known about but not produced in great numbers immediately upon the invention of a technique to haft effectively such an implement. It is only after the methods of casting copper (and later bronze) were mastered that the double axe could and did take its place as one of the most important implements of early mankind.

The evidence for the manufacturing of metal double axes in the Aegean is plentiful. There are moulds from different time periods extant, as well as many axes themselves. I will deal with the metallurgic developments in chronological order, that is: copper and its casting methods, then bronze and the casting methods peculiar to that metal. The design changes which resulted from the use of this new material will be discussed, as well as the hafts of the double axe. Finally, a catalogue will be provided listing the different types of double axes found in the Aegean during the time under consideration. This catalogue can then be used when we go on to examine the functions of the double axe.

It is in the late Neolithic period of the Aegean that copper objects begin to appear. It is in fact amazing that the Bronze Age came about at all as early man must have had a terrible time trying to work with copper, for it is a very difficult metal to smelt and cast. But at first the early metal worker would not have had to worry about either of these processes, he would simply have used small granules of 'native' copper acquired by panning rivers, in the same

way gold and other metals were first found. The first copper artefacts to appear are, in fact, small beads, pins and awls. The metal worker would simply cold hammer the granule to the desired shape. Cold working a metal hardens and strengthens it.¹⁴ But this same hardening can reduce the toughness of the metal to the point of cracking. The malleability of metal as compared with stone, however, led to the manufacturing of simple tools, such as small knives. At some time during this period of experimentation with the new metal tools, annealing was discovered. This is a process whereby the metal is heated to a temperature under its melting point, kept at that temperature for a short time, and then allowed to cool before being hammered into the desired shape.¹⁵ In this state the item is softer, more easily shaped and less inclined to brittleness. The metal worker could now hammer the blade longer (making it that much harder) before the point was reached at which the metal was embrittled and would begin to crack. The improvement in sharpness, the more durable edge and the relatively long life of the tools made of this "new material" would have created a desire for even larger tools to be made out of copper, especially the axe. A more plentiful and reliable source of copper had to be found.

Smelting copper ore then, is the next step. After some years of controversy historians agree that the first smelting furnace was

¹⁴J.F. Healy, Mining and Metallurgy in the Greek and Roman World, London: Thames and Hudson, 1978, 229.

¹⁵Healy, 231. See Glossary for more detailed information on annealing.

likely a pottery kiln.¹⁶ The discovery of a lump of copper in the bottom of a kiln (the metal having been smelted from a copper based pigment used on the pottery) could have led to experimentation in extracting the copper deliberately. That early man could reach and maintain in a controlled fashion the necessary temperature of 1083°C, has been shown by Colin Renfrew in his study of the techniques and temperatures needed to fire the pottery types in Northern Greece in the Late Neolithic period.¹⁷ After some trial and error it would have become obvious that a pottery kiln was too large and that in a smaller furnace it would be easier to raise and maintain the heat necessary to smelt the copper ore.

The first smelting furnaces were very simple in design. A shallow depression would be dug in the ground, usually on a slight incline. Inside was placed a clay crucible for catching the smelted copper and slag. Charcoal mixed with copper ore was then heaped over the furnace with a clay tuyere stuck through the pile. This clay "pipe" gave access to the forced air (from attached bellows) which was needed to raise the temperature of the furnace (Figure 18).¹⁸ The most common form of copper found by the miners of the

¹⁶ The other theory was that copper had been inadvertently smelted out of rocks used in an open hearth fire. The heat produced in this case would not, though, be enough to smelt copper. "Although experiments have shown that it is possible to smelt malachite and recover copper in an open fire by using a covered crucible, the process is [very] uncertain." (K. Branigan, Aegean Metalwork in the Early and Middle Bronze Age. Oxford: At the Clarendon Press, 1974, 68). In any case this would not be how smelting was discovered, as the use of a crucible shows, but instead a deliberate attempt to smelt the ore.

¹⁷Renfrew, The Emergence of Civilisation, 310.

¹⁸Tylecote, A History of Metallurgy, 17.

Figure 18
Early Copper Smelting Furnace

Aegean, was a sulphide ore. As copper tends to retain impurities, such as sulphur and oxygen, it was very difficult to smelt out the metal and a procedure of smelting, roasting and then a second smelting had to be developed. The solidified mass in the crucible after the first smelting had to be broken up and roasted to change the sulphide to an oxide.¹⁹ The copper oxide would then be put back in the furnace and a second smelt would take place. This time the slag would settle on top of the molten copper instead of in and through it. The metal worker could separate the slag from the copper because the metal cooled and hardened much more quickly than its impurities. Once separated from the slag, the copper then had to be melted in order to make a casting. The crucibles used in this melting often had handles so that they could be lifted as quickly as possible from furnace to mould because the metal began to cool and harden immediately upon removal from the heat. Eventually the need for melting the copper again was eliminated by a later development of the furnace. Stone sides were built up around the hole in the ground containing the crucible. The added height incorporated two outlets (Figure 19). Both were blocked at the beginning of the second smelt and then the higher of the two was opened in order to drain off the slag. The copper, still molten, could then be let out the lower opening and cast immediately in a waiting mould.

The first moulds used were made out of stone. They consisted of a matrix carved into the surface of a block of stone. Therefore

¹⁹The chemical formula for this reaction is $\text{Cu}_2\text{S} + 2\text{O}_2 \rightleftharpoons 2\text{CuO} + \text{SO}_2$ (Healy, 156-160).

Figure 19
Shaft Furnace

only one side of the tool would be cast. Smelting then, while it opened up the range in tools that could be produced in metal was limited at this stage to fairly simple, albeit large, implements. After casting, the 'spongy' side (exposure to air, especially with copper, causes bubbles on the surface of the item cast) is hammered flat. Subsequent annealing and cold hammering gave the implement a harder, more durable edge. This working also resulted in the characteristic splay edges mentioned earlier.

The first larger item which seems to have been made in any profusion in the Aegean is the flat axe.²⁰ This is a simple axe blade with lugs cast on both sides at the hafting end (Figure 20a). The axe head would simply be inserted into the wooden haft and bound in across the lugs with cord (Figure 20b). Cast copper, unworked, rates 87 on the Brinell scale of hardness. A partially annealed blade of copper is 135 on Brinell's scale. Both of these edges are much harder than those available in stone.²¹ The blade was inclined to be a bit brittle after all the hammering but it still performed much better than its stone counterpart. The importance of the axe to prehistoric society has already been demonstrated, so it is not surprising that this was the first tool to be produced in large numbers once the art of casting copper had been mastered. But why the flat axe instead of the shaft-hole axe? As previously shown, the idea of the shaft-hole was familiar to the people of this time and it would have made a much better implement in metal than the flat

²⁰Renfrew, The Emergence of Civilisation, 312.

²¹Healy, 228. See the Glossary (Appendix D) for more information on Brinell's scale of hardness.

Figure 20a
Egyptian Flat Axe Head

Figure 20b
Egyptian Flat Axe - Halted

axe. The reason that the flat axe was dominant initially, lies in the type of moulds required for casting a flat versus a shaft-hole axe and the metal being used, copper. There are two types of moulds, in casting, the first, already mentioned above, is the open mould, and the second, more complex, is the closed mould. The reason open moulds were preferred at first, was, in part, due to their basic simplicity and also because of the difficulties inherent in casting copper in a closed mould. H.H. Coghlan explains:

It is well known that pure copper is difficult to cast because the tendency to absorb gases leads to the formation of blow holes, so that the resultant casting is porous. The harmful elements in the making of sound copper castings are mainly sulphur and oxygen; small amounts of sulphur are enough to spoil a casting, and there is always a certain amount of oxygen taken up by the liquid copper from the atmosphere while the casting is being poured.²²

A closed mould is made of two pieces with holes in the top of the mould for pouring in the liquid metal and for letting off the gases produced. But, as mentioned above, liquid copper does not "push" the air out of the mould, nor does it let off all the gases, rather it absorbs them, making, instead of a solid well formed tool, an axe with hidden air pockets and irregularities. In an open mould, however, these irregularities are, for the most part, confined to the one surface and can be hammered out. As is evident, though, open mould casting requires much laborious forging after the casting, which is very time consuming. Due to the difficulty of casting copper, it was thought by many scholars that there was no closed

²²Coghlan, 51.

moulding before the Bronze Age. The problem with this theory is that there are examples, from the Chalcolithic Age, of double-sided shaft-hole implements, including double axes, which are made of pure copper! There were various attempts to explain these away but none really convincing. Coghlan, fascinated by this problem examined the makeup of the copper in the above cases. He found that they all contained at least .01% of arsenic or tin. Upon checking his findings with modern metallurgists he found that even this small amount of arsenic could act as a de-oxydizing agent, and, as long as there was no sulphur present in the sample, an excellent copper casting could be made in a closed mould, if certain conditions were met.²³ In order to understand the conditions which Coghlan lays out it is first necessary to examine briefly closed mould casting and its terminology.

A closed double axe mould or bi-valve mould, consists of two stones with identical matrices on facing sides, vents and placement marks (Figures 21a and 21b). Both sides of the object are cast. This enables a greater range of more sophisticated implements to be produced. The lack of exposure to air results in a lot less working needed to arrive at the finished item.

The mould's halves are registered by a series of marks on each piece. Then two clay funnels, or cups, are placed on the entry and exit vents. The mould is then heated (to avoid cracking during the casting) and placed in a sand pit. The molten metal is poured in the "runner" cup and when the metal worker sees that the other cup, the "riser", is filled, he knows he can stop pouring. These funnels do not

²³Coghlan, 51-2.

Figure 21a

Closed or Bi-Valve Mould
 α , β - Registration Markings
 γ - Repair of Damaged Section

Figure 21b

Interior Matrix of Figure 21a

simply serve to facilitate pouring, they also allow the gases from the metal itself, and those given off during contact with the mould, to escape. The mould is then covered in sand and left to harden.

The metal used in casting with a closed mould makes a great difference in the quality of the result. As mentioned above, copper does not easily give up gases and in a closed mould this could result in air pockets and other irregularities. But Coghlan has found that if the runners are extremely high and long they will "provide sufficient pressure head" for even copper to expell the gases.²⁴ The risers must also be high so that the copper first poured into the mould, which would pick up and push the air out and would therefore be very porous, is given enough space to clear the actual matrix (Figure 22).²⁵ The over size runners and risers will contain approximately four times the metal needed for the implement alone. But this excess copper would not have been wasted as the metal worker would simply have melted it down again for another casting.

Still, the vast majority of implements produced, during the Chalcolithic period, were from simple, open moulds. The double axe is an important sign to those studying this period as it "represents a metallurgical transition between the Copper Age and the Early Bronze Age, since some examples analysed [specifically in the Aegean] are of impure copper and others are bronzes"²⁶ It is interesting to note that, to date, no flat axes have been found on Crete.²⁷ This information, coupled with the fact that Crete is the first

²⁴Coghlan, 52.

²⁵Coghlan, 53.

²⁶Branigan, Aegean Metalwork , 33.

²⁷Branigan, Aegean Metalwork , 124.

Figure 22
Casting Copper in a Closed Mould

area in the Aegean to launch into full scale production of the shaft-hole double axe has prompted Keith Branigan to suggest that, in Crete at least, smelting copper and the idea of the double axe may have been passed on from contacts with the East and did not arise independently.²⁸ But it is in the Bronze Age, with all the advantages of that metal, that the double axe in the Aegean really comes into its own.

By the Early Bronze Age then, man had already been smelting and casting for quite some time. In addition to being an easier metal to work with, coldworked tin bronze is 270 on the Brinell scale of hardness. That is twice the hardness of hammer hardened copper.²⁹ For the first time the use of metal tools and weapons became widespread and this change in material and ease of manufacture resulted in unprecedented experimentation with new forms and variations on old tools. This age marks the beginning of the mass production of tools and the first craft specialisation. The double axe now moves to the front of the Aegean tool manufacturing scene, the only other large implement finds to rival it being those of the dagger.

There were two types of bronze prevalent in the Aegean at this time. They were arsenical bronze and tin bronze. There must be 2-3% tin in the mixture for it to qualify as bronze, but the best results usually come from a 10% tin alloy.³⁰ For arsenic, while up to an 8%

²⁸Branigan, Aegean Metalwork . . . 102.

²⁹Coghlan, 54.

³⁰Coghlan, 54.

alloy is possible, the higher the arsenic content the less working that can be done on the bronze before it begins to weaken.³¹ The Troad and the Cyclades used mainly tin bronze in the Early Bronze Age, and only tin bronze in the Middle and Late Bronze Age. Mainland Greece and Crete used mostly arsenical bronze throughout the Early and Middle periods but switched completely to tin bronze in the late Bronze Age.³² This was likely due to the fact that Crete and the mainland often had their tin supply interrupted and so used what was plentiful and on hand when they could not get the tin.³³

There is no inferiority in the bronze produced with the alloy arsenic, it is just as hard and durable and, in fact, it gave the bronze a "more beautiful" colour.³⁴ It does suffer from two drawbacks, however, when compared to tin. The first is that it is very difficult to calculate the exact amount of arsenic which ends up being alloyed with the copper.

This is partly because tin (unlike arsenic, we suspect) was available in its metallic form and could therefore be accurately apportioned. In addition, however, arsenic losses are high during the processes of roasting, smelting, and refining.³⁵

³¹J.A. Charles, "Early Arsenical Bronzes," The American Journal of Archaeology, 1967, Vol. 71, 21-23.

³²Branigan, Aegean Metalwork . . . , 74-76.

³³Exactly where the Aegean people got their tin supply is still a matter open to much debate. Branigan feels it was from the East and this why Troy never used arsenical bronze. He explains that once Crete (and later Mycenae) gained control of Aegean shipping they could ensure their tin supply and the use of arsenic as an alloy was effectively discontinued. Branigan, Aegean Metalwork . . . , 64-65.

³⁴Healy, 211.

³⁵Branigan, Aegean Metalwork . . . , 75.

These losses are due to the fact that during the alloying, arsenic, which has a lower melting point than copper, begins to boil off as the temperature is increased in order to melt the copper. Calculating accurately how much of the arsenic turns to gas before it comes in contact with the copper (which would stop the evaporation by raising the arsenic's melting point), was next to impossible for the metalworkers of the Bronze Age. The second disadvantage of using arsenic as an alloy is its toxicity. As the above description of the alloying makes clear, some arsenic is changed to its gaseous form during this process, and the metal workers had to be very careful because:

[the] extreme toxicity of practically all arsenic salts particularly the oxides, so readily formed during the processing of arsenic-containing minerals . . . [can result in] damage done to both the plant and animal life in the immediate vicinity.³⁶

These two drawbacks would explain then, why the use of arsenic, the more available of the two alloys, was eventually discontinued even though the bronze produced was not in any way inferior to that of tin bronze.³⁷

The advantages in casting of either type of bronze, over copper alone, are substantial. When melted, bronze is less viscous than copper and this results in easier pouring and sounder, close-grained

³⁶J.A. Charles, "Early Arsenical Bronzes," The American Journal of Archaeology, 1967, Vol. 71, 26.

³⁷The arsenic minerals most commonly used by the Minoan and Helladic cultures were Orpiment and Realgar. These are found near the surface in areas with a history of volcanic action. (Healy, 42).

castings.³⁸ The increase in liquidity also means that much more intricate moulds can be attempted. " In fact, without this addition of tin to the copper the complicated casting work of the developed Bronze Age could never have been attained."³⁹ There is no gas problem as the alloying of either arsenic or tin reduces substantially the copper's absorption of oxygen. Bronze, as cast, also has less brittleness than copper and, as previously mentioned, it is a much harder, therefore more durable, metal. It is obvious that now the closed mould will be used extensively as there are no difficulties in producing items from this type of mould with bronze. Open moulds are still used quite frequently for many simple tools such as chisels, awls and needles as a closed mould is really not necessary for such implements and an open mould is still the simpler of the two to manipulate. If it is not registered properly a bi-valve casting will leak metal and the whole casting process must be repeated. In addition, the open mould can carry many matrices on the one block, a more efficient method for a travelling metal worker. None the less, the flat axe begins its decline at this time, now that a fast and efficient way to produce the shaft-hole axe had been discovered.

The furnaces used to melt the copper and tin or arsenic changed only slightly in the Bronze Age. They are often built with access for a second tuyere for greater air flow (Figure 23). The process of smelting now simply involves adding a bit of the alloy in with the copper ore so that the two mix together. The casting

³⁸Coghlan, 54.

³⁹Coghlan, 54.

Figure 23
Bronze Age Furnace

process is also basically the same, with the only changes being in a new variety of moulds and one additional method of casting. ▀

The bi-valve mould dominated the metalworking scene in the Early Bronze Age. The caster would preheat a stone closed mould in order to avoid it cracking from the shock of contact with the heated metal. While runners were still used in order to aid in the pouring of the metal into the mould, risers were no longer as necessary for the gases were not the problem they had been in the Copper period. Instead there were ventilation holes.⁴⁰ The moulds were registered by markings on the outside and clamped together or pegged with dowels and placed in sand which also helped hold them in place. Before sealing the mould, a clay core was placed inside the mould ". . . [It is] the clay-sand core that makes the hole for the shaft".⁴¹ The metal when poured in, would flow around the core leaving a space for the shaft hole.

In the Bronze Age, stone is still the most popular material for a mould. Schist and steatite are the preferred minerals as they are soft enough to make carving easy. But now introduced are metal and clay moulds. The metal moulds are thinner than their stone counterparts, therefore lighter and less bulky to carry. The edges they produced on a just-cast tool were much sharper than those made with stone. This was because the metal moulds could be made thinner than the stone moulds and could therefore produce a finer blade edge which would require less sharpening and forging and as a result be less brittle. Unlike those in stone, metal moulds do not

⁴⁰Tylecote, A History of Metallurgy. 33.

⁴¹Tylecote, A History of Metallurgy. 33.

have to be pre-heated and quickly used. They can withstand the stress of contact with the heated metal much better than stone and will not crack. The casting process would have been to pour the molten metal directly into a dressed metal mould. The mould was dressed by exposing its surfaces to the smoke from burning oil. This step ensured that the hot metal would later come away from the mould without damaging it.⁴² The disadvantage of the metal mould was that it deteriorated faster than the stone due to distortion and some welding of hot metal to a badly dressed mould. It took great skill to dress the mould completely and as the cost of maintaining a metal mould was high, and they were difficult to replace but did not last as long as stone moulds, this type of mould, while superior to stone in some ways, was not that common. Few have been found extant, but that is because they were a valuable source of metal in their own right and would have been melted down for other purposes when their usefulness as a mould had finished.

Clay moulds were generally used for making clay objects and in conjunction with the Cire Perdue method of casting.⁴³ But as the only double axes this method produced were ceremonial and sacred in purpose; i.e. small and fine with inscriptions and designs rather

⁴²Tylecote, A History of Metallurgy, 33.

⁴³Tylecote, A History of Metallurgy, 33. Tylecote also mentions the possibility that some of the clays moulds found might have been intended for metal castings but he concludes that there is no evidence which help determine this use.

than a practical working implement, this process will not be discussed here.⁴⁴

The final step in the manufacturing of the double axe was to attach the axe head to the haft. The handles of the double axe were all made from hardwood.⁴⁵ There were a variety of methods for securing the haft to the head of the axe. One of the earliest was to insert the haft and then split the top end and drive in a wedge.⁴⁶ Another method was to trim the haft to almost exactly the size of the hole. It was then soaked in water and quickly inserted into the shaft-hole. Even when the wood dried it would still be slightly warped and swollen and would keep the shaft in place. The simplest method was to taper the end of the haft and force the axe head down until it was wedged in place. Later, this method was improved by the addition of a peg inserted through a hole in the shaft above the axe head. This peg helped hold the axe head down on the shaft. The grooves, found on double axe Types Ic and IIc, show how the axe head itself helped the pegs stay in place (Figure 24).⁴⁷ All the above methods were not foolproof and the axe heads would have had to be rehafted or at least repaired after each use. In general the longer the shaft hole (and therefore the larger the axe head) the better the 'fix' the haft could achieve. This is another reason why the metal shaft-hole axe was preferred over most stone shaft-hole axes.

⁴⁴For more information on this casting method see Colette Verlinden, "La Métallurgie Minoenne et la Fonte à la Cire Perdue," Bulletin de Correspondance Hellenique, 1986, Vol. 110, 41-52.

⁴⁵Mavryannaki, 202.

⁴⁶Coghlán, 47.

⁴⁷These "Types are found at the end of this chapter in the Catalogue.

Figure 24
Shaft-holes with Grooves

Figure 25
Collared Double Axes

The metal axe's long thin circular hole would grip the shaft along more of its length, whereas the stone shaft-hole of an hourglass shape would not touch the shaft in as many places and therefore could not grip it as well.⁴⁸ In fact the final development in the design of the axe has to do with increasing the security of the grip of the haft. The shape of the shaft-hole in the head of the axe was changed from circular to oval. An oval shape grips the handle better and results in fewer heads flying off in mid-air. This is because the shape prevents the shaft from twisting in its socket (and loosening), when the axe is levered out of the cut. The oval hole also allows a thinner head which again improves the depth of the cut.⁴⁹ It is still the shape preferred today in the manufacturing of axes. The Bronze Age smiths did not stop here in their attempts to secure the axe head to the haft. This is evident in the case of axes which required narrow blades but longer shaft-holes. Collars were added to the cast axe head, above and below the shaft-hole. This would have further extended the length of the hole and therefore ensured a better grip for the haft without a major increase in the size or weight of the blade (Figure 25).

The metal casting techniques of the Bronze Age and their resultant changes in the designing of the axe brought the double axe to its most efficient form, as Coghlan says:

I think one is justified in considering that the oval shaft-hole marks the culminating point in our shaft-hole axe evolution. After the Middle Bronze Age. . . we find all the essential functional features of the modern

⁴⁸Coghlan, 47.

⁴⁹Coghlan, 51.

axe already incorporated. Later, and especially during the Iron Age, we find refinements in proportion, and improvement in the available axe material, but no fundamental changes in type or construction.⁵⁰

This then, covers the manufacturing history of the double-bitted axe. Before turning to the second section, dealing with functions of the double axe, it would be appropriate to establish a catalogue listing the different types of double axes found in the Aegean area in the Bronze Age.

Five different scholars have, in the years ranging from 1959 to 1983, published a typological list of the double axes found. The first was H.G. Buchholtz, writing in 1959.⁵¹ She identifies five different types of double axes but makes no time, area or practical versus ritual distinctions. The second scholar is J. Deshayes in his work, Les Outils de Bronze, de L'Indus au Danube: IV^e au II^e Millénaire.⁵² He lists twelve different types of double axes. His typology cannot be used for this paper, however, as he covers a much wider area than the Aegean and includes purely ritualistic double axes in his catalogue. The third author is Keith Branigan, writing in 1974. He identifies five different types, practical not ritualistic, and is dealing only with the Aegean. But he is too limited in his time scope of the Early and Middle Bronze Age as there are some important types which only appear later on in the Bronze Age. The next writer, A. Harding (1975), simply subdivides some of Buchholtz's classifications

⁵⁰Coglan, 54.

⁵¹Mavriyannaki, 204.

⁵²Jean Deshayes, Les Outils de Bronze, de L'Indus au Danube, Vols I and II. Paris: Librairie Orientaliste Paul Geuthner, 1960, 105-108

and is of little help in the matter. The final scholar to attempt a catalogue of the double axe finds in the Aegean was Caterina Mavriyannaki in 1983. She was very conscious of the drawbacks mentioned above when dealing with the double axe in the whole of the Aegean during the Bronze Age, but settles for an excessively simplified method of classifying the double axe only in its two most prevalent forms. After studying the above catalogues I felt that for this paper it was necessary to compile a separate and completely relevant typology, albeit based on the information gathered from the above authors, especially Deshayes and Branigan as these two are the only writers who give details about where each axe was found and some information on the condition of the axes. In setting up the following catalogue, I have used the same method of classifying a type of double axe as did the above authors: the shape of the horizontal sides of the axe, the shape of the blade and the shape of the shaft-hole.

TYPE I

77

A: Straight sides
Straight blades
Circular shaft-hole

B: Straight sides
Straight blades
Oval shaft-hole

C: Straight sides
Straight blades
Oval shaft-hole with grooves

TYPE II

78

A: Curved sides
Convex blades
Circular shaft-hole

B: Curved sides
Convex blades
Oval shaft-hole

C: Curved Sides
Convex blades
Oval Shaft-hole with grooves

TYPE II

79

D: Curved sides with upper collar
Convex blades
Oval shaft-hole

E: Curved sides with upper and lower
collars
Convex blades
Oval shaft-hole

A: Straight upper side, Concave lower side
Convex blades
Circular shaft-hole, offset

B: Straight sides, lower shorter than upper
Oblique blades
Oval shaft-hole

TYPE IV

81

Wavy s/des
Convex' blades
Oval shaft-hole

The catalogue will serve not just as an overview of the different types of double axe in the Aegean Bronze Age, but will also act as a point of reference for the next two chapters dealing with the function of the axe. As the different possible functions are considered, I will refer back to this catalogue in order to illustrate which types could have been used for which distinct functions of the double-bitted axe.

SECTION II

INTRODUCTION

In this the second section of the thesis, having already dealt with the manufacturing details of the double axe, I will now turn to a functional survey of the implement. There are two major categories into which the different functions of the double axe can be separated. The first is that of the Tool and the second the Weapon. Although it is true that a weapon of war is a type of tool, the differing purposes, the one being constructive and the other destructive, serve to set these two uses apart.

In each of the following chapters I will explore how the axe could have been used in each function and why the double axe was the preferred tool for the task. In all the different uses of the axe to be studied, within the two major categories, an attempt will be made to match a specific Type of double axe, as listed in the catalogue provided in the previous chapter, with a particular function. The evidence to be used in supporting the different uses of the axe includes published archaeological reports and surveys, literary evidence, both contemporary and later sources, and modern functional parallels. After considering all the above information I will have illustrated all the functions of the double axe in the Aegean Bronze Age.

CHAPTER THREE

THE DOUBLE AXE FUNCTIONS IN THE TOOL CATEGORY

The double axe functioned as a tool in three different areas; woodworking, masonry and butchering. Under the heading of woodworking different double axe types performed specific tasks, which ranged from cutting down trees to shipbuilding. There is also a separate use for the axe in masonry, and one possible function relating to the butcher's trade.

The main use for the double axe in the ~~Bronze~~ Age was, even as it is today, for felling trees, the primary step in all logging. This essential step has to be carried out with both a maximum of speed and efficient use of energy. The axe is generally the tool used for this, although another possibility is the saw. The saws of the Bronze Age, were, however, not yet at a standard whereby they could perform with speed and efficiency in the environment of a logging area. They were adequate for furniture work and for cutting up small, already hewn, trees, but for little else in woodworking. ~~Even~~ Russell Meiggs, who is very impressed by the Minoan saws,

some of which even have partially set teeth,¹ admits that the saw would not often have been used even for trimming or planking because "cleaving with wedges remained an adequate and simpler process".² The axe, on the other hand, had none of the saw's problems. It combined a deep, long, thin cutting edge with sturdy weight and thickness for both the strength to withstand the shock of repeated blows and the added momentum of force behind the blow to drive the blade in more deeply. Its construction in the Bronze Age, using the shaft-hole hafting technique, enabled it to withstand the wrenching which resulted when the axe had to be pulled from a tree cut. The double axe head mounted on a long handle formed a powerful tree felling combination, if used by a skilled lumberjack in the following manner:

In use, one hand grasps the base of the handle and the other is taken up the handle close to the head at the start of the stroke. The tool is then poised, aimed, and swung at the trunk, and as the head flies through the air, describing an arc with the base of the handle as the centre, the 'head' hand is allowed to slip down the handle towards the base. In this way the axeman can

¹Setting the teeth in alternate directions on the saw prevents the sawdust choking the smooth passage of the blade. Of the many saws found on Crete, both large and small (they range from two to five feet long), only one has shown this technique and it does not run along the whole blade but occurs only in small groups along the saw. For more information see Russell Meiggs, Trees and Timber in the Ancient Mediterranean World, Oxford: At the Clarendon Press, 1982, 346-49.

²Meiggs, 347. "cleaving with wedges" refers to a planking process. The axe begins a split at one end of a log and a long flat wedge is inserted in the split. The ends of the wedge are struck with clubs on either side simultaneously until a plank is split off (Figure 26).

Figure 26
Planking Technique

use nearly every muscle of his arms, body, and legs, and put great force behind the blow.³

For all the above reasons it is obvious that the axe is suited to cutting down trees - but why the proliferation of double axes in the Bronze Age? In part, of course this is, as outlined in the previous section, due to an ability to make a sound double axe tool. In other words, the increase in number of double axes could be explained by the fact that they could now be more easily and effectively made. But why does the double axe supersede the flat and single axes? The flat axe, again from our earlier studies in manufacturing, would quite naturally be rejected because of its lack of stability and strength. But why would the single-bitted shaft-hole axe be less popular than the double-bitted version?

To begin with there is the simple fact that the "double" mass of the two-bitted axe gave the woodcutter's blow added weight and length while maintaining excellent balance. The depth to which the blow would sink would not be in any way impeded.

The double axe in manufacturing terms is a better tool because of the shape of the haft in the Bronze Age. A modern single-edged axe has a haft which is curved so that the head of the axe is set back upon the handle (Figure 27). The purpose of having the axe head in this position is to adjust the tool for balance. The single blade would normally be overbalanced on one side if simply placed on a straight

³R.A. Salaman, Dictionary of Tools Used in the Woodworking and Allied Trades c. 1700-1970. London George Allen & Unwin Ltd. 1975. 34

2 of/de 2

Mitsubishi

Figure 27
Modern Hafts

shaft. In the Bronze Age Aegean, however, straight shafts were the only sort used. Curved shafts did not come into use until the Middle Ages.⁴ So the single-edged axe was not the best balanced tool. In contrast, the double axe should always be hafted with a straight haft. Because there are two blades the tool is perfectly balanced and again is shown to be the ideal tool for this age.

The double-bitted axe then, is heavier, more stress-resistant and better balanced than a single axe. But all these qualifications could have been filled with a more varied implement, one that had two different functions on the same tool. As A.T. Hodge states:

It might be argued that, given a tool that was essentially double, the sensible thing would be to lend it versatility by making one half different, say, one straight edge and one curved.⁵

There are double tools known from this time and earlier. Some examples are the axe-hammer, axe-adze and axe-pick (Figure 28). They are not, however, very popular. This was due to the difficulties in making each tool-side completely effective. The leverage and center of weight needed for the swinging of an adze versus axe is quite different. Yet the tool had to be accurately balanced on the axe side and still function as a proper adze when turned over. This situation usually resulted in a compromise with neither axe nor adze side being perfectly balanced or set. But the double axe does not have this problem. Its shape and design are what make it ideal for

⁴Salaman, 48.

⁵A.T. Hodge, "The *Labrys*: Why was the Double Axe Double?" American Journal of Archaeology, April 1985, Vol. 89, No. 2, 307.

Figure 28
Double Tools

its tasks and result in no compromises to the implement. For this reason the double axe was the most popular of the double tools in the Bronze Age. In fact the double axe was not simply the most popular of the double tools at that time, but of all woodworking tools.

"The double axe . . . begins to proliferate in the MM [Middle Minoan-Middle Bronze] period."⁶ The reason that the double axe greatly increased in numbers at this time lies in two related factors. The first is that the Bronze Age brought with it an increased need for timber products. The need for axes to cut the trees, would obviously result in greater production. The second reason is that the double axe is a better woodcutter's tool than any of the single or double tools mentioned for the following reasons, gathered by Hodge, who went to modern sources to discover why they used the double axe. The first reason has to do with the sharpening of the axe. The two edges mean that the woodcutter could work twice as long without having to stop and sharpen his blade. Bronze is not the easiest metal to get an edge on as one could not simply use a whetstone because bronze is too soft a metal to sharpen in that way. Careful hammering and annealing are needed to sharpen and restore the bronze blade. In fact, the Romans who also used the double axe for tree felling, had special "one-side" covers made for their double axes to protect the reserve blade. This care was taken even though they were using

⁶Branigan, Aegean Metalwork of the Early and Middle Bronze Age. Oxford: At the Clarendon Press, 1974, 117.

⁷Hodge, 307-8.

axes of iron, which hold a sharper edge much longer than bronze (Figure 29).⁸

The second reason involves admitting that in some cases, the double axe was two different tools and not simply one blade repeating itself. For while both edges are most often identical in shape there are double axes which have one very thin and sharp blade, with the other blade being thicker and a bit blunter. While the sharper edge would be used for cutting across the grain on all but the hardest wood, the blunter edge could tackle harder woods and any needed splitting, i.e. cutting lengthwise along the grain.⁹ This thicker edge can also be kept for "topping and lopping" as it is in modern usage.¹⁰ This is a process whereby, after the tree has been cut down, the branches are "lopped" off and the top is cut off the tree at the logging site to make transportation easier.¹¹

Later literary support for the double axe's function as a woodworking tool, is found in Homer's Odyssey, Book Five. Here Homer is describing Odysseus' cutting and preparing trees in order to build a boat which will enable him to leave Calypso's island.

δῶκέν οἱ πέλεκυν μέγαν, ἄρμενον ἐν παλάμῃσι,
 χάλκεον, ἀμφοτέρωθεν ἀκαχμένον· αὐτὰρ ἐν αὐτῷ
 στείλειδον περικαλλὲς ἐλάινον, εὖ ἐναρηρὸς·
 δῶκε δ' ἔπειτα σκέπαρνον εὐξοον ἦρχε δ' ὁδοῖο
 νήσου ἐπ' ἐσχατιῇς, ὅθι δένδρεα μακρὰ πεφύκει,
 κλήθρη τ' αἰγείροσ' τ' ἐλάτη τ' ἦν οὐρανομήκης,

⁸Albert Neuburger, The Technical Arts and Sciences of the Ancients, (Trans. Henry L. Brose) London: Methuen and Co., Ltd., 1930. Reprint: New York: Barnes and Noble, Inc., 1969, 69.

⁹Hodge, 308.

¹⁰Salaman, 64.

¹¹Meiggs, 332.

Figure 29
Roman Axe Cover

αὐτὰρ πάλαι, περίκηλα, τὰ οἱ πλώοιεν ἐλαφρῶς.
 αὐτὰρ ἐπεὶ δὴ δεῖξ' ὅθι δένδρεα μακρὰ πεφύκει,
 ἡ μὲν ἔβη πρὸς δῶμα Καλυψῶ, δῖα βεάων,
 αὐτὰρ ὁ τάμνετο δοῦρα· βοῶς δέ οἱ ἦνυτο ἔργον
 εἴκοσι δ' ἔκβαλε πάντα, πελέκκησεν δ' ἄρα χαλκῷ,
 ξέσσε δ' ἐπισταμένως καὶ ἐπὶ στάθμην ἵθυεν.¹²

The Greek word *πέλεκυς* is translated by Liddell and Scott as " . . . a double-edged axe"¹³ and by G. Autenrieth in his Homeric Dictionary as " . . . an axe or hatchet for felling trees, double-edged."¹⁴ The reason both are so certain that *πέλεκυς* refers to the double axe, as opposed to the single-bitted axe, is the existence of the Greek word *ἡμιπέλεκκον* or "half-axe".

Another reason the double axe was suited to the job of felling trees can be found by looking at the most popular felling-axe in the

¹²Homer, Odyssey, Books I-XII (Revised edition) (Notes by W.W. Merry) Oxford: At the Clarendon Press, 1887. Book V; 234-245. The absence of a saw from this picture, the adze being used to the plane the boards, should also be noted.

¹³Liddell and Scott, Greek-English Lexicon (Abridged Edition) 1871, 541.

¹⁴Georg Autenreith, A Homeric Dictionary, 1876. (Trans. R.P. Keep; Rev. I. Flagg) Norman: University of Oklahoma Press, 1958, 226. The word *labrys*, often used to refer to the double-bitted axe, is believed to be a Carian (or Luvian) word in origin. (See W.R. Halliday, The Greek Questions of Plutarch, New York: Arno Press, 1975, 185-87). *Labrys* is not a Greek word and is not used by Homer. It is included in the Liddell and Scott Lexicon with its meaning given as *πέλεκυς*. Its chief connection with the double axe is in relation to the Carian worship of Zeus with a double axe and the Greek word *Λαβύρινθος* which was applied to Crete in mythology. For more information on this controversy see A.J. Evans, "The Mycenaean Tree and Pillar Cult," The Journal of Hellenic Studies, 1901, Vol. 21, 109; W.H.D. Rouse, "The Double Axe and the Labyrinth," The Journal of Hellenic Studies, 1901, Vol. 21, 268-274.

modern world - the Wedge Felling Axe (Figure 30).¹⁵ Although this is a single bitted axe, the reason for its popularity is an attribute which the Bronze Age double axe shared:

[The] outstanding characteristic of the Wedge Axe is the size of the poll [the butt]; . . . the heavy poll leads to a steadier and more reliable blow. The swollen sides make it easier to extricate the head when wedged tight in the cut.¹⁶

Due to the casting of the shaft-hole and the added weight of the second blade, the double axe easily fits the requirements of a good felling tool. After seeing the shape of the modern axe it would be appropriate at this time to try and determine which of the Types listed in the double axe catalogue were those used for woodcutting.

There are two types of double-bitted axe from the catalogue which can be identified as having been used for the felling of trees. The first is Type I. Even today the long straight blades are the best shape for getting a deep bite in the tree trunk. Another reason for this shape being ideal is put forward, again by R. Salaman in his Dictionary of Woodworking Tools. Salaman is still referring to a single-edged felling axe but as one can see in Figure 31, the blade is the same shape as one of the double-bitted axe Type I, so the comments on its cutting ability are just as relevant.

The long blade gave an advantage when undercutting the 'sink' (which was cut into the side of the tree to direct the fall), for it penetrated further; and it tended to produce a 'cupped out'

¹⁵Salaman, 55.

¹⁶Salaman, 55.

Figure 30
Wedge Felling Axes

Figure 31
Felling Axes

stump which would hold rainwater and consequently rot quicker.¹⁷

The second type of axe that would have been used by the woodcutter was Type II. This greatly resembles the popular Wedge Felling axe (note the swelling around the shaft-hole in II B) and the modern double-bitted, lopping and topping axes (Figure 32).¹⁸ Both Types I and II are the most commonly found styles of double axe from all over the Aegean in Bronze Age.¹⁹

The double-axe then, in relation to its use in felling trees, cut time wasted in sharpening, as well as energy wasted in swinging with a too light or a poorly balanced head. Just as the discovery of bronze enabled better axeheads to be manufactured so too did the use of the double axe enable the cutting down of large trees which were needed for shipping and architecture and which had been impossible to harvest in any great number previously.²⁰ Although the wood at this point leaves the logging site, it is not the end for the

¹⁷Salaman, 55.

¹⁸Type IV is a faint possibility as well. Salaman mentions that some axes are curved so that the user can avoid abraiding his knuckles when squaring timber. The curves of Type IV could reflect this purpose but this type is very rare and the use is doubtful (Salaman, 63).

¹⁹Jean Deshayes, Les Outils de Bronze, de L'Indus au Danube, Vol. I. Paris: Librairie Orientaliste Paul Geuthner, 1960, 105-108. Over sixty occurrences of these two types are listed as having been found in the Aegean region.

²⁰Meiggs, 330.

Figure 32
Modern Lopping and Topping Axe

double-axe, for its work did not take place solely at the logging site but also extended to the lumberyard and the carpenter's workshop.²¹

The timber was transported from the logging area to a storage area where the double-axe was used to square the wood in order to let the pieces dry more quickly.²² The type of blade required for this work is not the Type I of the logger but something closer to Type II, with the rounded, smaller blades, sharper on one side than the other.

Today this type of axe is known (in single-bit form) as the side axe.²³ Although, as mentioned above, there were saws at this time, for many reasons they would not have been used for the squaring procedure. The first reason is simply that of speed. The saws in the Early Bronze Age were not very strong or all that evenly poured when cast. There are very few saws big enough to cut through a tree and these have no frame and so would tend to bow and distort even when used by a two men, one at each end. Moreover, the saws were not as thin as they should have been to be entirely effective because an implement of bronze that thin would have had no strength. Although one of the saws found to date has its teeth set alternately, the majority do not and this would necessitate the saw being lifted at the end of each stroke, replaced in the groove and drawn again.²⁴ The small saws were mainly used in furniture making and lighter,

²¹This fact is not reflected in the modern use of the double axe which is restricted to the lumberyard. But we can still draw parallels with modern, specially shaped, single-headed axes, in cases where their blade designs match those of the different double axes.

²²Meiggs, 346.

²³Salaman, 62

²⁴See Footnote 1, this chapter.

finer work to which the double-axe, in turn, was not suited.²⁵ But Orlandos proposes, in his work on later Greek construction practices, that the Minoan saws had been using for cutting down and trimming timber. He seems to have confused their abilities with those of the later iron saws.²⁶ It is interesting to note, however, that speaking about carpentry practice as late as the Middle Ages, R.H. Thompson says that, "splitting and squaring with the axe is faster than sawing" and so, even after the advent of the iron saw, the axe was still used for squaring and trimming.²⁷ This is largely due to the fact that the axe is more manoeuvrable than the saw and has the:

...ability to follow the angles or taper of the timber thus avoiding wastage and retaining full strength.²⁸

The whole of the Aegean area seems to have used the double-axe in conjunction with other carpentry tools.²⁹ This is supported archaeologically by the great number of double axes found in "carpentry hoards". The importance of the woodworking industry in the Bronze Age is clearly demonstrated by great number of these hoards found.

²⁵Meiggs, 112. The larger saws were used in masonry work, as will be briefly described later.

²⁶A. Orlandos, Les Matériaux de Construction et la Technique Architecturale des Anciens Grecs. Première Partie (Trans. Vanna Hadjimichali) Paris: Editions E. de Boccard, 1966 34-5.

²⁷R.H. Thompson, "The Medieval Artisan" in Singer, E.J. Holmyard, A.R. Hall, A History of Technology. Vol.II, Oxford: At the Clarendon Press, 1954, 389-90.

²⁸Salaman, 63.

²⁹Meiggs, 346.

the hoards of metalwork from the Aegean are in no case founders' hoards (discovered at a foundry site); some of them are hoards of precious personal possessions, others hoards of "wealth" perhaps, but several are certainly hoards of carpenter's tools and nothing else.³⁰

Among the implements found in the hoards are chisels, single axes, awls and a few small saws. These are obviously not logging tools but rather implements for use in carpentry. Carpenter's hoards are not isolated in one particular area but are distributed all over the Aegean. The map following gives the location of those from the Early and Middle Bronze Ages (Figure 33).

It was noted above that among the tools found in the carpenters' hoards were some single axe heads. Once again the question of why the double axe should have been used, this time in connection with carpentry, is raised. Why not use single axes for carpentry, as is the more modern practice? The answer is that weight, balance and sharpening advantages all still add up to greater speed and ability. But in carpentry precision and a light, exact touch are also very important. In fact, a small axe can often be more useful to the carpenter than the clumsier double axe. When one has to start making small, light double-headed axes in order to perform the the job needed it is a short step to realizing that

³⁰K. Branigan, Aegean Metalwork of the Early and Middle Bronze Age, Oxford: At the Clarendon Press, 1974, 134.

Figure 33
Aegean Metal Hoards
(Early and Middle Bronze Age)

a single-bitted axe will do just as well, if not better. It is this fact which, with the introduction of iron, eventually phased out the double axe from any work where the added weight was not necessary. For in cases like these the only reason one would put up with the clumsiness of the double axe was the fact that it meant one's work was less interrupted by the need to sharpen the axe blade. Later on, with the introduction of iron which holds its edge much better than bronze, there was no reason to put up with the disadvantages of the double axe. It is, in fact, only in Crete that the double axe seems to have been preferred for carpentry to the exclusion of all other axes; on the mainland, in the Cyclades and the Troad there were plenty of single-headed axes found along with (but not instead of) double axes. It is in Crete, then, that we find the greatest range in size and shape of the double axe. While in general carpentry, i.e. furniture making and fine work, there are no specific tasks to which the double axe is ideally suited, there are other areas of woodworking, especially shipbuilding and architecture, in which it is an important tool.³¹

It was not only because the bronze double axe enabled larger trees to be cut down that it was an essential part of the shipbuilding industry.³² It could have served an important function at the shipyard in the actual building of the ships.³³ In the Middle Ages it

³¹See Appendix C for a map of the Aegean Double Axe finds to 1960.

³²Hugd Blümner, Technologie und Terminologie der Gewerbe und Künste bei Griechen und Römern, Vol.II, Hildesheim: Georg Olms Verlagsbuchhandlung, 1969, 202.

³³Neuburger, 483.

was a popular tool at such a site because the double axe supplied two of the necessary attributes of a shipbuilder's axe:

Axe, Shipwright's . . . These have long, heavy blades —weighing up to eight pounds and are used for paring and trimming ship's timbers.³⁴

Remembering the catalogue in chapter two, the axe for a shipbuilder would be a Type II with long blades. Its flared shape is used in the same way this type could have "topped and lopped" at the logging camp but in this instance it is used to square and trim the ships' timbers and masts. This job involves constant and long hours of work and the double-axe's advantage of simply turning over for another sharp blade would have been indispensable in this area of woodworking.³⁵ A site specific to shipbuilding in the Aegean from this time has not, however, been identified. So archaeologically it is impossible to say for sure whether the double axe was used for this purpose but taking the above information into account it is quite likely.

That the axe was used as a woodworking tool can, then, be shown from contemporary archaeological evidence, later literary evidence and modern parallels. There were, however, other functions for the axe as a tool. These include uses in masonry and the slaughtering of animals. Unfortunately neither are as solidly documented by Bronze Age archaeological finds as are the functions of the double axe in relation to woodworking.

³⁴Salaman, 62.

³⁵Salaman, 59, 62.

In addition to a surge in the demand for timber, the building of the palaces and forts of the Bronze Age Aegean required stonework. The masonry industry was greatly aided by the discovery of bronze especially in relation to the saw. Bronze saws were used to "slice off" stone facing slabs which would be placed in front of the rough rubble interior walls as facing pieces. But before being set in place the slabs were carefully dressed by a double axe and then a chisel. As Luigi Pernier states in his Palazzo Minoico di Festòs:

Credo che all'uso di questo strumento, di cui vediamo le tracce ancora vive sui colossali ortostati della fronte occidentale, l'architettura minoica debba il suo ardito balzo fuori della meschinità edilizia del periodo precedente, in cui si murava soltanto con sassi quasi infermi; e che perciò i Cretesi lo scegliessero come simbolo sacro della forza umana, considerando il palazzo cretese per eccellenza, quello di Cnossòs, come una creazione della *labrys*, il *labyrinthos* o edificio della doppia ascia.³⁶

J.W. Graham in his book on the construction of the palaces of Crete mentions in his discussion of the Minoan masons tools, that "Large numbers of bronze chisels, saws, and double axes have been found, especially at Hagia Triadha." ³⁷ He does not make clear, however, why this "large number" of tools are to be considered masonry as opposed to carpentry implements. R.W. Hutchinson connects the origin of the word *πέλεκυς* with an earlier Assyrian word

³⁶Luigi Pernier and Luisa Banti, Il Palazzo Minoico di Festòs, Vol.II, Rome: La Libreria dello Stato, 1952, 441.

³⁷J.W. Graham, The Palaces of Crete, 1969. (Reprint) New Jersey: Princeton University Press, 1985, 154.

peléki "to split or cut stone".³⁸ Other axe specialists such as H.H. Coghlan speak of "the true symmetrical double axe . . . not only as a working tool in stone . . ." ³⁹ Sir W.M. Flinders Petrie, writing in Tools and Weapons, mentions that the double axe is "still a tool used by bricklayers" and that an elongated version of the double axe was a modification " . . . perhaps for hewing rock."⁴⁰ Colin Renfrew also refers to the use of the double axe in dressed stone masonry but he does mention his indebtedness to Pernier and Graham.⁴¹ All are frustratingly silent on their grounds for believing these to be masonry axes.

It was necessary to examine masonry techniques in modern construction manuals in order to discover what the above authors seem to have taken as general knowledge. W.L. Webb and W.H. Gibson clearly define the use of the double axe in masonry:

Ax or Pean Hammer: This tool is similar to the double-bladed woodax. It is used after the stone is rough-pointed [planed], to make drafts along the edges of the stone. For rubble work, and even for squared-stone work, no finer tool need be used.⁴²

³⁸R.W. Hutchinson, Prehistoric Crete, (Revised Edition) London: Cox and Wyman Ltd., 1968, 225.

³⁹H.H. Coghlan, "The Evolution of the Axe from Prehistoric to Roman Times" The Journal of the Royal Anthropological Institute, 1943, Vol.73, 48.

⁴⁰W.M. Flinders Petrie, Tools and Weapons, Wiltshire: Aris and Phillips Ltd., 1917, 13.

⁴¹C. Renfrew, The Emergence of Civilisation. The Cyclades and the Aegean in the Third Millenium B.C. London: Methuen and Co., Ltd., 1972, 348-9.

⁴²Webb and Gibson, "Stone Masonry and Plain Concrete Construction," in The Cyclopedia of Architecture, Carpentry and Building, Vol.IV, Chicago: American Technical Society, 1912, 95.

In terms more closely related to the claims of Pernier and Graham, Alec Clifton-Taylor and A.S. Ireson describe the masonry process of "hammer-dressing" and explain that depending on the hardness of the stone either saws (softer stone) or axes (harder stone) were used for the dressing.⁴³ This then would be the purpose of the axes found in association with Aegean masonry.

It is difficult to determine which type of double axe would have been used for masonry work. Graham does not describe or illustrate the axes he mentions as being found at Hagia Triadha, nor an excavation report which might be checked. Branigan and Deshayes both list Type II axes at Hagia Triadha but not in what context they were found. The shape of the masonry double axes in the above mentioned manuals is not specific; with line drawings which range from Type I to Type II. So it is possible, but far from certain, that the Type II was, in addition to its woodworking function, the style for the masonry tool as well.

The information gathered from the construction manuals, coupled with the archaeological evidence presented by Graham and others gives strong support to function of the double axe as a masonry tool. It is safe to conclude that, on Crete at least, one of the functions of the double axe was the dressing and preparing of stone for use in the building of the palaces. There is no evidence for masonry double axes being used by the Mycenaeans or even the people of the Troad, as their methods of construction were quite

⁴³A. Clifton-Taylor and A.S. Ireson, English Stone Building. London: Victor Gollancz Ltd., 1983, 79-80.

different and involved the use of ashlar masonry instead of the dressed gypsum slabs for covering the Minoan rubble masonry used for the interior palace walls.⁴⁴

The last function to be examined in the Tool category is the possible use of the double axe in the slaughtering of animals. There is no specific archaeological find site that has been identified as an abattoir. However, later in Greece the double axe is used for both everyday and ritual slaughter.⁴⁵ Homer twice specifies the double axe when referring to the tool used to kill a bull and a cow. The first reference is found in a simile describing the reaction of a man pierced by a thrown spear:

ὣς δ' ὅτ' ἄν' ὀξὺν ἔχων πέλεκυν αἰζήιος ἀνὴρ,
κόψας ἐξόπιθεν κεράων βοὸς ἀγραύλοιο,
ἵνα τάμῃ διὰ πᾶσαν, ὃ δὲ προθορῶν ἐρίπησιν,
ὥς ἄρ' ὃ γε προθορῶν πέσεν ὕπτιος.⁴⁶

While the above passage describes the normal slaughter of an animal for the table the second reference, given below, deals with the ritual killing of a bull.

Αὐτὰρ ἐπεὶ ῥ' εὖξαντο καὶ οὐλοχύτας προβάλοντο

⁴⁴Graham, 153-155.

⁴⁵Rouse, in his article "The Double Axe and the Labyrinth," mentions a double axe dedicated to Apollo "... in the post-Mycenaean period ... [which] seems to have commemorated the sacrifice of an ox". (*Journal of Hellenic Studies*, 1901, Vol. 21, 270).

⁴⁶Homer, *Iliad*. (Notes by D.B. Monro) Oxford: At the Clarendon Press, 1884. Book XVII; 520-523.

αὐτίκα Νέστορος υἱὸς, ὑπέρθυμος Θρασυμήδης,
 ἤλασεν ἄγχι στάς· πέλεκυς δ' ἀπέκοψε τένοντας
 αὐχενίους, λῦσεν δὲ βοὸς μένος· αἱ δ' ὀλόλυξαν
 θυγατέρες τε νυοί· τε καὶ αἰδοίη παρὰ κούρῃς
 Νέστορος, Εὐρυδίκη, πρέσβα Κλυμένοιο θυγατρῶν.
 οἱ μὲν ἔπειτ' ἀνελόντες ἀπὸ χθονὸς εὐρυοδείης
 ἔσχον· ἀτὰρ σφάξεν Πεισίστρατος, ὄρχαμος ἀνδρῶν.⁴⁷

Both of these passages use *πέλεκυς* for axe, referring to the double-bitted axe.⁴⁸ The scholars in the study of the axe, however, are, in the main, silent on this possible function of the double axe. R. Hutchinson, in a humorous aside, mentions the possibility that the axe was a butcher's tool based on the fact that a bronze hammer-bitted axe has been found, from 6th century B.C. Calabria, which has an inscription indicating it was dedicated by a cook.⁴⁹ W. M. F. Petrie mentions, not a double axe but an "axe with a spike at the back . . . was the Dutch butcher's axe for killing cattle in 1694".⁵⁰ So the axe as a tool for butchering is documented. But the use of the double axe for this purpose is not all that definite. M.P. Nilsson in his study of the Minoan and Mycenaean Religions believes that the double axe was used as a sacrificial tool in the Bronze Age.

⁴⁷Homer, *Odyssey*, III; 447-454.

⁴⁸When Homer wished to specify single-bitted axes he did use *ἡμιπέλεκκον*. When he was just talking of an axe and did not know or care which type the more general term *ἄξινη* was used. I have used in all my supporting quotes only those which specifically refer to the *πέλεκυς* so that there can be no doubt as to which axe is being discussed.

⁴⁹R.W. Hutchinson, "Battle-axes in the Aegean," *The Proceedings of the Prehistoric Society*, (Second Session), 1950, Vol.15, No. 4, 65.

⁵⁰Petrie, 12.

...it must first have been necessary to stun such a strong animal as a bull before he could be lifted up and placed on the slaughtering table, and the proper instrument for this was the double axe.⁵¹

This suggestion is not supported in any of the Minoan or Mycenaean depictions of bulls on altars whether on rings, vases or sarcophagi. It is, in fact, very hard to imagine the double axe used to "stun" an animal; surely a hammer would have been preferred?⁵² This would be especially true in the case of ritual slaughter where the presentation of the animal would have been important. Nilsson claims his idea is supported by the many instances of the double axe being pictured between the horns of consecration or the actual head of the bull, but it is more likely that the axe was simply used to kill the bull with one clean stroke. However, the one clear depiction of a bull's blood being ritually taken does not agree with either of these statements. The picture is on a Late Bronze Age sarcophagus found in Crete and shows the bull tied to the altar, completely intact and awake, with the blood draining from his neck into a jar (Figure 34). Still, the killing of cattle with the axe is strongly supported by the literary and later dedications quoted above. Also, in describing the Vikings' use of the singled edged battle axe in a fight, T. Wise states that a swing with two hands could "literally slice the head off a

⁵¹M.P. Nilsson, The Minoan-Mycenaean Religion and its Survival in Greek Religion, (Second Revised Edition) Lund: C.W. Gleerup, 1968, 231. R.F. Willetts also feels the double axe was a sacrificial weapon but gives no supporting evidence (Cretan Cults and Festivals, London: Routledge and Kegan Paul, 1962, 43).

⁵²Or even a hammer-butted axe, a type of battle axe which will be discussed in the following chapter.

Figure 34
Sacrifice Scene on Sarcophagus
(Late Bronze Age)

horse".⁵³ The references from Homer in support of this function are quite direct and incontestable. Although it might be hard for people today to picture this function of the axe, it being a seemingly heavy-handed tool for the task, the literary indications, at least, are that the double axe was used as a implement for butchering the bull. It is not, however, a function which is strongly supported archaeologically, although what would constitute support from archaeology, in this case, is difficult to say.

We come then, to the end of the discussion of the double axe's functions in the Tool Category. One can see the only use which is backed by strong Bronze Age archaeological evidence is that of the axe as a woodworking tool. The combination of archaeological evidence, later literary evidence and the continued use of the double axe in this area by the Greeks, Romans, Medieval societies and even today's woodcutters, makes this function undeniable. The use of the axe in masonry, while not as convincingly shown due a lack of specific archaeological references, is none the less quite well supported by the scholars of Bronze Age construction techniques (in conjunction with the helpful explanations of later sources). The function of the axe in relation to its use as a butcher's tool is again not strongly supported by archaeological evidence but is quite well documented by later from Greece and Europe. It is very probable then, that the double axe was used to slaughter animals in the Bronze Age.

⁵³Terence Wise, Saxon, Viking and Norman, Men-At-Arms-Series. (Editor Martin Windrow) London: Osprey Publishing Ltd., 1979, 25.

The potential for the double axe as a tool having been thoroughly explored it is time to turn to the second category of functions, the weapon. The study of this aspect of the double axe, for various reasons to be explained, is not as straightforward as that of its companion category of Tools.

CHAPTER FOUR

THE DOUBLE AXE FUNCTIONS IN THE WEAPONS CATEGORY

Using the axe as a weapon dates back into early prehistory. While primitive man favoured weapons which kept distance between himself and his opponent, in an emergency, an everyday tool would have been used in defense and, as shown above in Chapter One, the axe was one of the oldest and most versatile tools at that time. So the potential of the axe as a weapon would have been apparent from the beginning. It is not, however, until the Chalcolithic age that evidence has been found of an axe specifically designed to function as a weapon, and not simply a tool which doubled as a weapon by necessity.¹

There were two different styles of battle axes used in prehistory. Evidence for each consists of a great number of such axes, identified as the only possible weapons, found in the graves and remains attributed to " . . . a group of cultures characterized by double axes or hammer-axes of stone . . . ".² Both types of battle axe seem to have acquired their own popularity in two separate regions of the ancient world but:

¹Kenneth P. Oakley, Man the Tool-Maker, 1(Revised Edition) London: The Trustees of the British Museum, 1952, 33.

²R.W. Hutchinson, "Battle-axes in the Aegean," The Proceedings of the Prehistoric Society, Vol. 15, No. 4, 1950, 52.

The origin of the whole series of battle-axes should perhaps be sought ultimately in Mesopotamia, where socketed battle-axes were in use from the beginning of the third millenium . . . ³

The double-bitted style was first used as a battle axe in the Asian region, and it is at Tall Arpachiyah, Assyria, that the earliest double axes, dated to the Neolithic Age, have been found.⁴ For the most part the Asians seem to have preferred curving, symmetrical blades, but there is also a "combined" form in which the blades of the axe curve downwards while the top edge is kept straight. (Figure 35).⁵

The European (South Russian, Nordic) style is more of a double weapon and is described below by R. Smith:

The axe hammer properly so called, with a cutting edge more or less sharp, a hammer-shaped butt (Figure 36), and perforation about the middle for hafting, is derived from the double axe . . . [which] has a long history and goes back to about 3000 B.C. in the Mediterranean area.⁶

³V.G. Childe, "Stone Battle Axes From Troy," Man, May 1924, No.51, 68.

⁴M.E.L. Mallowan and J. Cruikshank Rose, Prehistoric Assyria: The Excavations at Tall Arpachiyah -1933, London: Oxford University Press, 1935. (Reprint from Iraq. Vol.2, Part 1.), 91.

⁵Jean Deshayes, Les Outils de Bronze de L'Indus au Danube (IV^e au II^e Millénaire), Vols. I and II., Paris: Librairie Orientaliste Paul Geuthner, 1960, 108.

⁶R.A. Smith, "The Perforated Axe-Hammers of Britain," Archaeologia, 1926, Vol. 77, 78.

Figure 35

Asian Double-bitted Battle Axe

Figure 36

European Hammer-bitted Battle Axe

While the Troad exhibits both types of weapons, the Cyclades and Crete show a definite Asian (Anatolian) influence. The Greek mainland, in the Early to Middle Helladic periods, before there was much Minoan-Mycenaean interaction, shows a 'more European bent' in its choice of battle axe style.

As regards the Aegean, then, we can claim the double axe as a specifically Minoan type with a North-Syrian derivation of its own behind it, and contrast with it the stone hammer-bitted battle axes of Troy and Thermi, with their occasional counterparts in Macedonia, Thessaly, and Central Greece.⁷

Later, in Middle Helladic III and Late Helladic, the mainland also adopts the double-bitted axe and the incidences of hammer-bitted axes die out.⁸

Regardless of which region the Aegean people took their shape of the battle axe from, its use in battle was the same. Throughout history the axe in war has been synonymous with ferocity and barbarity " . . . for when wielded with both hands it could cleave through any armour and the man inside it . . . ".⁹ The axe was used in "close-in" fighting, usually on foot. It was a heavy smashing weapon, simple and direct in application.

⁷Hawkes, "The Double Axe in Prehistoric Europe," The Annual of the British School at Athens, 1936-37, Vol. 36, 141.

⁸This is undoubtedly due to the influence of Crete and the spreading of her ideas. It is paralleled by the spread of dagger types and the development of the long sword, from Crete to the mainland. Keith Branigan, Aegean Metalwork of the Early and Middle Bronze Age, Oxford: At the Clarendon Press, 1974, 116-117.

⁹T. Wise, Saxon, Viking and Norman, Men At Arms Series. (Editor Martin Windrow) London, Osprey Publishing, 1979, 25.

The axe was held with the left hand uppermost so that it was swung from the left shoulder to catch an opponent on his unshielded side.¹⁰

It requires no great skill to swing an axe but does require strength in the arms. Usually the fighting man preferred a distance weapon to begin an encounter (i.e. the Greek spear or the Asian bow and arrow) but when in close combat he would ordinarily switch to a thrusting weapon, such as a dagger, sword, or spear.¹¹ But with the advent of body armour (before more advanced technology had improved the sword) these thrusting weapons were not as effective as they had been against the unarmoured, or leather armoured, foe. This is due to the fact that bronze, while in many ways better than stone or copper, was not strong enough in a long, thin form (such as a sword or spear) to withstand the stress of breaking through shields or armour and still stay sharp, or indeed, intact. The axe combined the weight and edge needed both to get through the armour (or helm) and to withstand the shock of the blow. The main disadvantage in wielding the axe was conversely that which made it so ideal - its weight. As previously mentioned it required great strength to fight with the axe for any length of time. This could be offset by making the axe lighter but then its effectiveness against armour would be compromised. This "disadvantage" had an interesting side effect; because only the strongest men could wield the axe for any length of time and a single blow was usually enough

¹⁰Wise, 26.

¹¹A. Snodgrass, Early Greek Armour and Weapons, Edinburgh: At the University Press, 1964, 138.

to kill an opponent, the double axe became a status symbol indicating great strength and prowess in battle.¹² This conclusion is drawn from the finds of ceremonial battle axes in graves, especially in the East, the Troad and on Crete.¹³ The reality of the situation was, however, if the first blow did not result in the death of the opponent, it could mean the death of the wielder. This is because the double axe is a swinging, not a thrusting weapon. A soldier would be exposed at the end of his swing for a certain period of time, during which he would be extremely vulnerable. A quick thrust with a sword from behind a shield does expose the forearm but the vitals are still effectively protected. The axe would have been more awkward to use behind a shield and resulted in more exposure to enemy attack and "both attacker and attacked relied mainly on agility to survive".¹⁴

The reason is clear then, why though the axe was an ideal weapon versus armor, a heavy spear was preferred by most soldiers in hand-to-hand fighting. The spear head was usually strong enough to withstand the first thrust into armour or a shield, and not break or bend. As armour improved the spear head became wider and more rounded to impart more strength to the blade without increasing the thickness substantially. The spear too, though, had its disadvantages, the first being its length in close combat, which is often awkward,

¹²Later, in the Middle Ages, only axemen, the best and most agile, were allowed to be bodyguards to the Saxon Kings. (Wise, 26.)

¹³We know the axes are ceremonial because they are made from precious stones and are often carved or otherwise decorated and inscribed (See Figures 16 and 17 in Chapter Two). These include both the double-bitted and hammer-bitted variety of axes.

¹⁴Wise, 26.

and the second was its tendency to get stuck in the shield or body of an opponent, exposing the fighter as he tried to free his weapon. The axe did not have either of these problems. Obviously length was not a factor and the double axe did not stick in the wound for the same reason, if used properly, that it did not stick in the cut of a tree: the swelling of the blade as it reached the shaft-hole area. The deep curve or droop to the blade delivered more damage in a blow and so was especially suited to battle.¹⁵ Interestingly, T. Wise, writing about the weapons and tactics of the Saxons, Normans and Vikings, describes the combined use of the axe and the spear, with the soldier making the best use of the two weapons' advantages and disadvantages:

The weapon [a Frankish spear] was thrown into the opponents shield . . . The weight of the [spear] pulled the shield down, and a warrior might also tread on the trailing end of the shaft to pull his opponent's shield down further.¹⁶

His opponent's shield being down, all the fighter had to do was swing with his axe. An advantage that the double axe wielder had over other fighters was the option of a quick back swing without having to adjust the hold on the weapon. This back swing would only be used in dire need, however, as to be swinging back and forth constantly would also be to constantly leave oneself open and vulnerable. It is not surprising, then, that the sword quickly took

¹⁵Sir W.M.F. Petrie, Tools and Weapons, London: British School of Archaeology, 1917, 7.

¹⁶Wise, 11.

precedence over both the axe and the thrusting spear in the iron age. But "In bronze, blades must be short and relatively thick, for they blunt and bend too easily. The full length sword would have been impractical . . . " 17

There is one other aspect to the use of the axe as a weapon. This is described by Paul Courbin in his report on the finds of a Geometric warrior's tomb at Argos.¹⁸ In describing the function of the two double axes he has found he states:

. . . elles permettaient surtout de défoncer la coque des bateaux . . . [elles] sont liées, rappelons-le, à l'attaque des navires.¹⁹

This use of the double axe in war is also supported by Scholiast T (referring to Iliad, XV 710) who claims the double axe could be used to break up ships.²⁰ It is clear that the axe would be the ideal dual purpose weapon-tool in this case, for when not slashing at enemies the sailors could go to work on the hull of the ship.

The double axe was, however, superseded by other weapons after the introduction of iron:

The battle-axe . . . with a long pedigree in Prehistoric times, has not been recognised as a weapon of war in Greece after the Middle Bronze Age . . . [when] the developments in equipment and tactics finally

¹⁷T. Winteringham, The Story of Weapons and Tactics, New York: Books for Libraries Press, 1943, 23.

¹⁸Paul Courbin, "Une Tombe Géométrique D'Argos" Bulletin de Correspondance Hellénique, Vol.81, 322-386.

¹⁹Courbin, 368, 385.

²⁰Scholiast T quoted in H.L. Lorimer's Homer and the Monuments, Oxford: At the University Press, 1946, 305.

rendered it obsolete.²¹

The sword in iron could be made with a strong, long lasting blade and performed both cutting and thrusting functions with less exposure and weight than the double axe. The change in fighting tactics, with armies concentrating on moving closer together and fighting as a unit instead of a loose collection of individuals, added to the demise of the axe, which required a great deal of space to be effectively wielded.

Now, while the above clearly shows the use of the battle axe and why it was an excellent yet not the most popular weapon, it does not follow automatically that the double axe was used as a weapon in the Aegean during the Bronze Age. This I will now attempt to show based on the evidence from areas surrounding the Aegean, the archaeological finds and the literature (both contemporary and later) of the people in that region.

The first step in illustrating the possible military function of the double axe in the Aegean Bronze Age is to look into the known martial history of the Aegean and the surrounding areas at that time for evidence of use of such a weapon.

²¹A. Snodgrass, 166. It might be noted that, in the above quotation, Snodgrass says the battle axe went out of use before the end of the Bronze Age. This is not the position taken in this thesis and Snodgrass amends the misinformation himself in a footnote to the sentence quoted above. On page 258, note 34, he says that a winged axe (double-bitted), believed to be a battle axe, was found in Late Helladic III context at Mycenae. He admits then, that the axe was in use as a weapon up to the Iron Age.

To begin with, the peoples of Asia Minor definitely favoured the double axe as a weapon.²² "The double axe occurs first in the Royal Cemetery at Ur, [then] becomes accepted in Syria"²³ A battle axe was also used in Egypt at this time, but it was a single crescent shaped blade (Figure 37).²⁴ All over Europe, shaft-hole axes were in use by the Battle Axe Cultures and the many people they influenced.²⁵

The above evidence illustrates that the battle axe, in one form or another, was widely known in the areas surrounding the Aegean before and during that region's Bronze Age. Troy was obviously greatly influenced by her more Eastern neighbours as many battle axes of both types have been found there.²⁶ During the Middle Minoan and Middle Helladic periods each of these cultures had extensive trade relations with their neighbours to the east and so would have been acquainted with the use of the axe as a weapon in war, even the double axe specifically. There was no hesitation or taboo in either the Minoan or Mycenaean history about adopting different aspects of Eastern culture as can be seen in pottery influences, habitation, weapons development, etc.

In fact, in the case of the Minoans, their origins have been proposed as somewhere from Asia Minor, with the Carians or Luvians being the most likely candidates.²⁷ Both of these peoples

²²Hutchinson, "Battle Axes in the Aegean," 58.

²³Hutchinson, "Battle Axes in the Aegean," 52.

²⁴Petrie, 7-8.

²⁵Hawkes, 146-158.

²⁶Hutchinson, "Battle Axes in the Aegean," 58-59.

²⁷Emily Vermeule, Greece in the Bronze Age, (Revised Edition) Chicago: University of Chicago Press, 1972, 62.

Figure 37
Egyptian Battle Axe

held the double axe in reverence as the weapon of their chief male sky deity.²⁸

It can then be established that the cultures in the Aegean during the Bronze Age, on the mainland, in the Troad, the Cyclades and on Crete, manufactured the double axe and knew of its possible use in war. The next step then, is to examine the archaeological finds from the Bronze Age Aegean and see if there is any solid evidence supporting the use of the double axe as a weapon by these same people.

In the ruins of Troy are found many Bronze Age axe-hammers and double axes, especially on levels IIc, III and IV Treasure L.²⁹ These examples from Troy include both practical and ceremonial weapons. Quite a few battle axes appear at Thermi, on Lesbos, but due to the fact that many are broken or fragmentary it is unclear which are double axes and which are of the hammer-bitted variety.³⁰ Evidence from Tenedos, also in the Troad, shows the double axe as the favoured weapon.³¹ On the mainland the double-bitted battle axe has been identified only at Vaphio (near Sparta) and more recently at Mycenae.³² The hammer-bitted variety is found at many sites in a Bronze Age context such as Thessaly, Messenia, Delphi and in Boeotia.³³ These axes are identified as

²⁸A.B. Cook, Zeus: A Study in Ancient Religion, Vol.II, Part I, New York: Biblo and Tannen, 1925, 516.

²⁹Hutchinson, "Battle Axes in the Aegean," 58.

³⁰Winifred Lamb, Excavations at Thermi in Lesbos, Cambridge: At the University Press, 1936, 182-3.

³¹A.J. Evans, "The Mycenaean Tree and Pillar Cult," The Journal of Hellenic Studies, 1901, Vol. 21, 108.

³²Hutchinson, "Battle Axes in the Aegean," 52.

³³Hutchinson, "Battle Axes in the Aegean," 59-60.

weapons because of their shape and the the fact that they were found amongst other weapons. Renfrew, in his reseach on the burial practices of the Cyclades, Crete and the mainland, has noted that:

The correlation between personal status and the possession of richly adorned weapons, cannot be overemphasised. The graves suggest that a fine weapon was an essential mark of status for any rich and important man.³⁴

But from the major centres of occupation in the Aegean Bronze Age on the mainland (with the exception of Mycenae), and on Crete, only three axes have been identified as weapons. Two are from Mallia, on Crete, one a hammer-bitted type and the other uncertain as it is fragmentary.³⁵ The one example of a double-bitted battle axe from Mycenae was found in a Late Helladic IIIB context.³⁶ But are these really the only weapon-axes found? The question arises because double axes have been found in all the major centers of the Aegean but have not been attributed a military function. Leaving the why of this question to be discussed at the end of this chapter, I will review the archaeological evidence of the double axe finds beginning with reference to the Type Catalogue to see which of the types listed could have been used as battle axes.

Type II is a likely candidate as it has the weight and curved blade necessary for a battle-axe. But as this type is also ideal for

³⁴C. Renfrew, The Emergence of Civilisation: The Cyclades and the Aegean in the Third Millenium B.C., London: Methuen and Co., Ltd., 1972, 394.

³⁵Hutchinson, "Battle Axes in the Aegean," 59.

³⁶Snodgrass, 166.

woodworking it would not be safe to assume that it is a weapon unless there is other supporting evidence in a specific instance. By far the best choices are the Type IIIa and b axes. These double axes, with their drooping and angulated blades, are directly reminiscent of the sloping hammer-bitted battle axes of the time. As no comparative woodworking, masonry or butchery uses were found for these axes it is quite possible that they were a special weapon type. In Etruria, at a later date, the drooping double axe is shown in a relief being used as a weapon.³⁷ The identification of this type with a military function is also supported by the even more exaggerated drooping shape of the single-edged battle axes from the Middle Ages onward (Figure 38). Also, Type IIIa, with the off-set shaft-hole is the double axe type defined by Oakley as the first style of prehistoric battle axe to be made in stone.³⁸ It is also possible that Type IV was a battle axe as its blades and other characteristics conform to the specifications of a battle axe, but as only one such axe has been found thus far it can not have been a widely used style. Type III then, seems to be the most probable style of battle axe used in the Aegean.

The ideal procedure in attempting to differentiate the double axe weapon from the tool would be to refer to the existing records of Branigan, Deshayes and Mavriyannaki, in order to determine the contexts of the double axe finds. Unfortunately while they regularly

³⁷Petrie, 13.

³⁸Oakley, 33.

Figure 38
Saxon Battle Axe

report where the axes were found neither Deshayes nor Mavriyannaki list any contexts for the finds and Branigan only mentions specific details in a few cases.³⁹ Most of these are the axes from the carpenter's hoards, previously mentioned in chapter two, because these can be surely identified as tools. The other double axes which were found come from mixed collections, for the most part, and are assumed to be tools. But why "two examples found lying outside Platanos Tomb A" should be classified as tools is unexplained.⁴⁰ The same is true of the double axes found in tombs at Mesara "with spear heads, knives and razors", again the tool function is assumed.⁴¹ Of course, we cannot say that they were definitely weapons, but grave finds are likely to be weapons as the quotation from Renfrew above has pointed out.⁴² Unlike the carpenter's hoards there are no "warrior's" hoards. There are many hoards which contain weapons and tools, or weapons, tools and furniture, or simply a miscellany of metal goods but none which consist solely of a hoard of weapons. So once again a positive identification cannot be made. In fact there is little point in pursuing this line of inquiry any further. Even Branigan admits that many of the finds do not seem to "have associations (or published

³⁹Deshayes, Les Outils de Bronze . . . , 105-108; C. Mavriyannaki, "La Double Hache Dans le Monde Hellénique a L'Age du Bronze," Revue Archaeologique, Vol. 2, 1983, 207-209; Branigan, Aegean Metalwork . . . , 21-22.

⁴⁰Branigan, Aegean Metalwork . . . , 21.

⁴¹K. Branigan, The Tombs of Mesara: A Study of Funerary Architecture and Ritual in Southern Crete, 2800-1700 B.C., London: Gerald Duckworth and Co., Ltd., 1970, 20.

⁴²See this paper, page 126.

associations)".⁴³ Without the essential contexts of the finds it is only possible to show that there could be more double-bitted axes which were used as weapons than have been attributed to this function thus far.⁴⁴ From actual archaeological finds, then, we should turn to contemporary and later literary evidence and see if it can support more definitely the use of the double axe as a weapon.

The contemporary literary sources for the Bronze Age are comprised of the hieroglyphic tablets from Phaistos, the Linear A inscriptions and the Linear B tablets. The hieroglyphics include the sign 36, the double axe. Unfortunately this in no way aids our exploration of the function of the axe as the use of the symbol indicates only that the double axe was known about at that time (2000-1660 B.C.) and not what its function might be. And, as the script has not yet been deciphered, we do not know what meaning the sign holds, even were that to be helpful. Branigan has done some interesting work trying to explain the hieroglyphic signs 12 and 36 (the single and double axe) but also concludes that:

The evidence for the history of this tool and hence of its parallel hieroglyphic sign is just not abundant enough or clear enough to enable us to draw any

⁴³Branigan, Aegean Metalwork . . . , 21.

⁴⁴It is unfortunate that no damage wear analyses have been performed on any of the Aegean axes. In America such research has included only the axe in stone thus far: J. Sonnenfeld, "Interpreting the Function of Primitive Implements," American Antiquity, 1962, Vol. 28, No. 1, 56-65. See Also: C.M. Keller, "The Development of Edge Damage Patterns on Stone Tools," Man, 1966, (New Series) Vol. 1, No. 4, 510-11.

sound conclusions.⁴⁵

The two scripts Linear A and B are known as syllabaries.⁴⁶ They include two types of signs. The first (and majority) are those actually representing syllables such as: = da-pu₂-ri-to-jo (or translated to the possible Greek of λαβύρινθος.). The double axe symbol, generally believed to have evolved from the earlier hieroglyphic script is in Linear A and in Linear B. The value assigned in Linear B (the only one of the two syllabaries translated) is the sound "a". But again this tells us nothing of the function of the double axe. That must be left to the other symbols.

The second type of signs are known as "ideograms". These represent actual objects.⁴⁷ On any given tablet, listing the contents of a room or jar, the following pattern of information is used: the name of the item is given first, then a description of the item and or its condition. The next sign is the ideogram or picture of the item and finally, the amount or quantity of the item present is given. In this case, if a double axe ideogram could be found it might be possible to identify its function in relation to that one tablet at least. One such inscription has been found on a mainland tablet series from Pylos, known as the Ta series. This series of tablets is believed to be listing the contents of either the grave or storeroom of a prominent person from Pylos. The specific tablet we are concerned with from

⁴⁵Keith Branigan, "The Prehistory of Hieroglyphic Signs 12 and 36," *Kadmos*, Vol. 5, 1966, 116.

⁴⁶See Appendix B i for a comparison of the three writing systems.

⁴⁷See Appendix B ii.

this series is known as the Ta 716 and it is reproduced below with translation:

†	Υ	+	+	⋈	Υ	⋈	+	⋈	+	†	Υ	⋈	"	⋈	β	—X	"
pa	sa	ro		ku	ru	so		a	pi		to	ni	jo	2	wa	o	—X 2
⋈	⋈	β	⋈		†		"										
qi	si	pe	e		†		2										

(Two swords with large gold rivets on the hilt. Two double axes
Two knives

The original publisher of the tablets, E.L. Bennett Jr., classified the symbol of the double axe, above, as that of a weapon. He included it as such on his chart of the Mycenaean ideograms.⁴⁸ But John Chadwick, in the first published translation of the tablet, believed that the symbol shown above could not be a double axe, let alone a weapon, because "small votive double axes are not this rectangular shape"⁴⁹ He endeavored to explain the symbol as a rivet in sectional view, relating to the swords.

In the years following, between Ventris and Chadwick's first edition of Documents In Mycenaean Greek in 1956, and the revised edition in 1973, this interpretation came under much discussion and

⁴⁸See Appendix B, ii.

⁴⁹Michael Ventris & John Chadwick, Documents in Mycenaean Greek, (Revised Edition). Cambridge: At the University Press, 1973, 347. The most common shape of the votive double axes are very exaggerated variations on Type II from the Catalogue.

Chadwick revised his earlier statement, based on suggestions from Leonard R. Palmer⁵⁰ and George E. Mylonas.⁵¹ Palmer had pointed out that "a sectional view of a rivet" was going a bit far in attempting to explain something that did not seem to fit in with the rest of the tablet. He went on to suggest that, if this was a listing of a burial chamber, a votive double axe would not be out of place. But Palmer did not explain why the shape of "ritual" axe was unlike the standard sacred double axe, the very issue which had troubled Chadwick in the first place. Mylonas, however, addressed this problem directly, with much thought. In his ongoing battle to show that the double axe was not a Mycenaean religious symbol (only a Minoan), Mylonas disagreed with Palmer's suggestion. Instead he says:

It seems to me that the double axe cannot stand always as a religious symbol. After all the double axe was a tool in the closing years of the Mycenaean age. How else could they represent the ideogram of the double axe - the tool? Two useful tools - double axes - are specified, I believe, in the tablets.⁵²

After all this then, Chadwick, in 1973, agreed that the symbol indeed represented the double axe and favoured Mylonas' idea of the axe being useful. I would like to put forward, at this point, the view that the symbol in question represents, as Bennett first

⁵⁰L.R. Palmer, The Interpretation of Mycenaean Greek Texts. Oxford: At the Clarendon Press, 1963, 359.

⁵¹G.E. Mylonas, "Three Late Mycenaean Knives," American Journal of Archaeology, 1962, Vol. 66, 407.

⁵²Mylonas, 407.

surmised, a weapon.⁵³ This theory in no way invalidates any of Mylonas' excellent reasoning as to the practicality of the item, but does make more sense in light of the contents of the rest of the inscription, namely two swords and two knives.⁵⁴ This, of course, is not to say that every Mycenaean double axe was a weapon, simply that in this case, a weapon is being listed among other weapons. If another tablet were to be found which listed the double axe in a collection of tools, the function would obviously be that of a tool. Such a find would not, however, in any way affect the conclusions drawn above. Unfortunately, no other tablet with the double axe ideogram has been published to date.

The only other literary sources which could possibly apply to the Aegean Bronze Age are the works of Homer. The word used for the double axe as a weapon is the same as that used in references to the axe as a tool, *πέλεκυς* but, in the first case at least, there is no doubt that it is to a weapon that Homer is referring. This passage is found in the Iliad XIII and describes the fight between Menelaüs and Peisandros. Menelaüs threw his spear and missed, while Peisandros' spear struck Menelaüs' shield but did not pierce it. Both now move in for close combat:

Ἀτρεΐδης δὲ ἐρυσσάμενος ξίφος ἀργυρόηλον
 ἄλτ' ἐπὶ Πεισάνδρῳ· ὃ δ' ὑπ' ἀσπίδος εἴλετο καλήν
 ἀξίνην εὐχάλκον, ἐλαΐνῃ ἀμφὶ πέλεκυ.

⁵³It is impossible to assign a specific Type for this axe as the stylization of the script ideograms confuse the identification.

⁵⁴These knives are not simply eating utensils, or the like, but weapons themselves as Mylonas illustrates in his article "Three Late Mycenaean Knives," 406-408.

μακρῷ ἐϋξέστω· ἅμα δ' ἀλλήλων ἐφίκοντο.⁵⁵

In addition to clearly stating that Peisandros carried a double axe as his weapon this passage goes on to demonstrate one of the disadvantages of fighting with the axe; Peisandros is killed with a quick thrust of Menelaüs' sword as his arms are raised to strike at the latter's head. There is no argument here from commentators, indeed none is possible, but that is not the case with the second example of the double axe as a weapon in Homer. This passage, also from the Iliad, describes the desperate fighting of the Achaeans who have been forced into a complete retreat and who are now trying to stop the Trojans from setting their ships on fire:

τοῦ περ δὴ περὶ νηὸς Ἀχαιοὶ τε Τρῳεῖς τε
 δῆουν ἀλλήλους αὐτοσχεδόν· οὐδ' ἄρα τοί γε
 τόξων αἰκᾶς ἀμφὶς μένον οὐδέ τ' ἀκέντων,
 ἀλλ' οὔ γ' ἐγγύθεν ἰστάμενοι, ἕνα θυμὸν ἔχοντες,
 ὀξέσι δὴ πελέκεσσι καὶ ἀξίνησι μάχοντο
 καὶ ξίφεσιν μεγάλοισι καὶ ἔγχεσιν ἀμφιγύοισι.⁵⁶

The double axe, as mentioned earlier, was a weapon used in hand-to-hand fighting, which is obviously the case here as the Greeks cannot retreat any further. A. Lang, writing in 1908, has no problem at all in saying that this is an example of the use of the

⁵⁵Homer, *Iliad* (Notes by D.B. Monro) Oxford: At the Clarendon Press, 1893, Book XIII; 610-613.

⁵⁶Homer, *Iliad* XV; 707-712.

battle axe.⁵⁷ Later commentators, however, are unwilling to accept the double axe as a weapon, and attempt to explain the above use of the double axe in the following manner:

It is true that in [this passage] we find the Greeks fighting with axes, but that seems to be an accident due to the nature of the battle among the ships and huts, where every man fights with the first thing that comes to hand; it does not prove that the axe was a regular weapon for battle.⁵⁸

There are problems with this interpretation of the passage because not all the Greeks mentioned above used battle axes, many continued using their swords. Homer does go on to describe how effectively the axes were wielded, as M.M. Willcock points out in his commentary:

... some of the swords fell from the hands of their owners, while others fell, scabbard and all, when the sword-strap over the shoulder was cut, or when the shoulders themselves were chopped by axes.⁵⁹

The suggestion that the Greeks simply "fought with what was at hand" presupposes an unrealistic number of axes just lying about the area at the foot of the ships. Yet, if the axe was not a popular

⁵⁷Andrew Lang, "Homer and Anthropology," in Anthropology and the Classics, (Editor: R.R. Marett), Oxford: At the Clarendon Press, 1908, 57.

⁵⁸Walter Leaf and M.A. Bayfield's note to the text of Homer's Iliad, Vol. II, London: Macmillan and Co., Ltd., 1962, 321

⁵⁹Malcolm M. Willcock, A Companion to the Iliad, Chicago: The University of Chicago Press, 1976, 174.

weapon, how can one explain the sudden presence of so many soldiers fighting with one? Scholiast T is quoted, with regards this passage, as saying " . . . the double axe was not only for fighting but also for breaking up the ships."⁶⁰ In this statement the Scholiast has taken for granted the use of the axe as a weapon and is bringing up its second function in connection with war - that of a mariner's weapon. This is not the place to go into all the difficulties in accepting or rejecting Homer as a historian or the problems with the Scholiasts, but both seem, in this case, to feel that the Achaeans used the double axe as a weapon, while not clearly stating in the second passage presented, whether or not the double axes were tools used as weapons or weapons in their own right.

A similar, but much later, statement is made by Herodotus in Book Seven of his Histories. Herodotus puts these words in the mouths of the Spartans, whom the Persian King is trying to persuade, to switch sides:

τὸ μὲν γὰρ δοῦλος
εἶναι ἐξπίσται, ἐλευθερίας δὲ οὐκ ἔπειρήθης,
οὔτ' εἰ ἔστι γλυκὺ, οὔτ' εἰ μή. εἰ γὰρ αὐτῆς
πειρήσαιο, οὐκ ἂν δόρασι συμβουλεύοις ἡμῖν περὶ
αὐτῆς μάχεσθαι, ἀλλὰ καὶ πελέκεσι.⁶¹

The commentators in this case (far removed from the Minoan-Mycenaean sphere) have no difficulty in explaining this passage:

"The battle axe was only resorted to in close and deadly combat; c.f.

⁶⁰Quoted in H. L. Lorimer, 305.

⁶¹Herodotus, The Histories. (Notes by Agnata F. Butler) London: MacMillan and Co., Ltd., 1899, Book VII; 135, 71.

II. XV:711".⁶² One finds here no argument or attempt to deny that the axe could have been a true weapon. The simplest interpretation is to be preferred and I do not think one must belabor the issue in order to excuse the axe from being a weapon.

It can be seen then, that literary references of the period in question and later, support the idea that the double axe could be and was used as a weapon as well as being a tool. But time and time again in the exploration of this possible function of the double axe we come across a palpable resistance from many of the scholars doing research on matters pertaining to this region and time. It is this problem which is next to be looked at as we conclude the evidence for the use of the double axe as a weapon in the Aegean Bronze Age.

It is obviously difficult when studying ancient history to "prove" any opinion or theory. It is made doubly difficult in the case of this thesis as we are dealing with a time with scant literary sources, many untranslated and others which are uncertain as to time and references. There is the added problem as well, in relation to the Aegean Bronze Age, of strong feelings being present behind certain discoveries and opinions on the ancient peoples of this area. These constantly impede a clear analysis of the evidence, archaeological as well as literary, pertaining to the Aegean peoples. Nowhere is this last difficulty as evident as in the study of the double axe. This is largely due to the inescapable fact that the double axe was one of the most important religious symbols of the Minoans. In and of itself this might not be such a stumbling block. But the fact that the Minoans are regarded as an extremely peaceful

⁶²Herodotus, In the notes on page 218.

people, coupled with the religious importance of the double axe, has led to a great reluctance among scholars to even consider that the double axe could have had a military significance. This is the case even though A.B. Cook has done an exhaustive study on the symbolism of the double axe only to find that it was regarded as the thunder weapon of quite a few male sky deities in and around the Aegean.⁶³ R.M. Burrows enlarges upon this by saying that :

In the early aniconic stages of religion, before the days of graven images, the object in which the divine spirit was thought to be imminent was sometimes the axe or shield that was man's weapon of defense against his enemies . . . It is possible that the type of the thunderbolt commonly associated with him [male sky god] may have been at least partially suggested by a degraded type of battleaxe.⁶⁴

The association of the axe with a peaceful people, and the fact of its relative unpopularity as a weapon, both contribute to the fact that many scholars refuse to admit that the double axe could have been used as a weapon.⁶⁵ On occasion they will go to great lengths to avoid any possible military association with the double axe. An

⁶³Cook, 540.

⁶⁴Burrows, The Discoveries in Crete. London: Kennikat Press, 1907, 112.

⁶⁵As early as 1901 W.H.D. Rouse tried to caution scholars not to jump to hasty conclusions about the double axe. He was speaking more of the religious speculations at the time but his advice could have been well-noted by all of the Aegean scholars (Rouse, 273).

example of the problem facing the exploration of this function of the double axe is the controversy surrounding the Argos Tomb finds.⁶⁶

In 1957, Paul Courbin published his archaeological findings of the panoply tomb at Argos. Here he found a suit of bronze armour, a helmet and all the accoutrements necessary for a warrior, and a set of double axes. He concluded, quite naturally, that the axes were this warrior's weapons. There were no other possible weapons in the grave. Two years later W. Deonna published what he felt was an opposing view. Deonna argued that the axes were purely symbolic just like those found all over Minoan funerary vases and in the Minoan sarcophagi and the double axes in question were not actually weapons, simply "Armes mystiques, elles protègent le mort dans sa tombe".⁶⁷ In one sentence he denies that these axes were weapons and in another says they defended the dead. Courbin, in his reply to Deonna, asks:

M^r Deonna écrit que le casque et le cuirasse
<<continuer>> à protéger le mort dans l'au-
delà: c'est admettre que ces armes lui ont
appartenu et qu'il les a utilisés pendant sa
vie. *Pourquoi n'en serait-il pas de même des
haches?* ⁶⁸

⁶⁶The double axes in question are from the Dark Age of Greece and made of iron, but the problem involved in their classification is identical to that faced by the researcher into the Bronze Age and so the presentation is relevant.

⁶⁷Waldemar Deonna, "Haches, Broches et Chenets dans une Tombes Géométrique D'Argos," Bulletin de Correspondance Hellénique, 1959. Vol. 83, 249.

⁶⁸Paul Courbin, Response published at the end of the above article (Deonna, 252). Unfortunately W. Deonna died before he could write a reply to Courbin's question.

The divergence of opinion is typical of this issue, even in a case such as this, when the tomb in question is clearly that of a warrior and the double axes were the only possible weapons found.

In direct reference to the Bronze Age, Keith Branigan too, seems unable to consider, even long enough to dismiss it, the possibility that the double axe was a weapon as well as a tool. In describing the contents of some of the earliest graves from Early Minoan II he says:

From these deposits we can see the range of products increase in EM II to include at least two . . . new long dagger types, midrib triangular daggers, the first spears and arrowheads, a dagger sufficiently elongated to be labelled as a short-sword, and the first of the Minoan double axes.⁶⁹

Branigan continues, explaining that the development of weapons was mainly concentrated in Crete at this time:

It was here [Crete] that the major weapons of the later Bronze Age evolved from EBA types, and it was from here that several items of standard MBA and LBA equipment were adopted. These include the double axe, which begins to proliferate in the MM period⁷⁰

But from this point on, ignoring the parallel development of the double axe and weapons as a whole in the Bronze Age, Branigan separates the double axe from the weapons group and speaks of

⁶⁹Branigan, Aegean Metalwork. . . 106.

⁷⁰Branigan, Aegean Metalwork. . . 117.

them solely in the context of tools. In fact he does not restrict this treatment to the axe, but when trying to explain the puzzling fact that the "peaceful" Minoans were leaders in weapon production and development in the Aegean, attempts to explain the dagger and its evolution into the long sword as follows;

... the major role of the Cretan dagger was not as an offensive weapon but rather as an all-purpose knife ... The identification of the long-dagger as an offensive weapon does not necessarily imply a war-like society either. In the absence of any signs of warfare one might justifiably conclude that it was worn for any one or several other reasons -- ceremony, status, protection from wild animals are some that spring to mind.⁷¹

The attitude displayed above ranges from some scholars flatly denying the possibility that the double axe was a weapon,⁷² to those to whom it simply does not seem to occur: they do not deny the possibility, but they also do not mention it.⁷³ Any ceremonial axe (i.e. one in practical proportions but showing a high degree of artistry and no evidence of use), is assumed to simply be "sacred" or for some ritual purpose, but only in a peaceful sense. Never do the above scholars stop to consider that these might be ceremonial battle axes

⁷¹Branigan, Aegean Metalwork. . . . 145.

⁷²Deshayes falls into this category. He does not believe that the double axe was used as a weapon until the Etrurians begin to do so -- never the Greeks! (Deshayes, 261). M.P. Nilsson too denies that the double axe was a weapon; (Nilsson, The Minoan-Mycenaean Religion and its Survival in Greek Religion, (Revised Edition) Lund: C.W. Gleerup, 1968, n.25, 220-221).

⁷³Renfrew is the prime example of this problem. While he discusses finds of the double axe he does not consider the possible martial aspect of the implement.

Petrie, however, writing in Tools and Weapons, in his section dealing specifically with the double axe, mentions the above "ritual" finds and includes even those which would not have been functional when he says: "That a type of weapon, which was continually in practical use might also have a ceremonial significance, is shown by the great spear heads . . . and many other examples".⁷⁴

The quotation of Petrie above displays the most logical response to the attitude of the Aegean specialists. That is, one should turn to those scholars who are weapons experts, or who can at least consider the double axe in general and who do not have a specific Aegean background. Unfortunately, the results are usually equally frustrating.

G.C. Stone, states in his work, The Construction, Decoration and Use of Arms And Armor : " . . . the axe was the favorite weapon as long as armor was worn . . . " but he gives no supporting evidence or references.⁷⁵ Hutchinson, Hawkes and Childe all have written on the double axe in Europe, Asia and the Aegean, and assume in almost every case that the double axe is a weapon, just as those above assume it is a tool. It is indeed ironic that in every article published on double axes outside of the Aegean area, all double axes are immediately classified as battle axes, and, in fact, the possibility of

⁷⁴Petrie, 13. The non-functional axes referred to are, for example less than a centimetre thick, made of gold, etc.

⁷⁵G.C. Stone, A Glossary of the Construction, Decoration and Use of Arms and Armour. New York: Jack Brussel, 1934, 79.

their having been tools is ignored!⁷⁶ These non-Aegean scholars do not trouble to explain why they classify the double axe as a weapon and only Hutchinson, jokingly, in one article admits the possibility, that all the weapons he's been mentioning might not be weapons at all.

Here we must face the depressing possibility that has been lurking in the background, namely that our splendid battle-axes with which our Indo-Europeans are supposed to have fought their way through Europe were nothing more than the tools of miners, masons and carpenters.⁷⁷

And in a later reference, previously mentioned, to the hammer-bitted battle axe dedicated by a cook of the 6th century B.C., he asks; "Are battle-axes then only the implement with which the cook chopped up the family joint?"⁷⁸ Actually, in this part of his article Hutchinson seems to be considering only the hammer-bitted battle axes. While he mentions the double axe early in the paper, he

⁷⁶Examples of these articles are: C.F.C. Hawkes, "The Double Axe in Prehistoric Europe," Annual of the British School at Athens, 1936-37, Vol. 36, 141-159. Stuart Piggott, "Bronze Double Axes in the British Isles," The Proceedings of the Prehistoric Society, 1953, Vol. 19, 224-226. S. Piggott, "The Early Bronze Age in Wessex," The Proceedings of the Prehistoric Society, 1938, Vol. 4, No.3, 52-106. R.A. Smith, "The Perforated Axe-hammers of Britain," Archaeologia, 1926, Vol. 77, 77-108.

⁷⁷Hutchinson, "Battle Axes in the Aegean," 62.

⁷⁸Hutchinson, "Battle Axes in the Aegean," 64.

makes no statement as to whether it specifically was used in war or not.⁷⁹

There are even those in this group of "weapon's experts" who will twist the evidence to support their theory, just as others do in the tool function. M. Quennell notes that some double axes are blunt on one side and sharp on the other. Ignoring or ignorant of the explanation given for this, in relation to the axe's use in woodcutting, he claims that "[the ancients] purposely blunted the double-edged battle axes so that there was less chance of cutting the wielder and just as much power against the enemy".⁸⁰

The only exception to the rule is A.M. Snodgrass. In his work entitled Early Greek Arms And Armour, Snodgrass supports his claim that axes in the Geometric Age were used as weapons. He quotes from Homer the passages already mentioned and gives specific examples and place finds.⁸¹ Unfortunately, he is dealing with a later time period and iron double axes, but much of his information is useful and all is well documented with archaeological and literary

⁷⁹Hutchinson does give his views on the Minoan double axe in his later work, Prehistoric Crete. (Revised Edition) London: Cox and Wyman Ltd., 1968, 225. Here he says that the Minoan double axe was only a tool, not a weapon. But he goes on to state that in other cases around the Aegean the double axe was a weapon, citing Homer as support. So the only double axe he considers as being a tool is that of the Minoans - another example of the "peaceful people" syndrome.

⁸⁰Quennell, Everyday Life in Prehistoric Times. (Revised Edition) London: B.T. Batsford Ltd., 1959, 127.

⁸¹Snodgrass, Early Greek Arms and Armour. Edinburgh: At the University Press, 1964, 166-67.

evidence.⁸² In his only reference to the Bronze Age and the double axe he says:

... the battle axe is twice mentioned in Homer and once specifically stated to be of bronze. The likely examples of this weapon from Proto-Geometric and later levels were exclusively of iron, so that here again, as with the swords and spears, we may detect a possible survival of a Bronze Age tradition.⁸³

Taken as whole, however, while these "weapons experts" are convenient to quote in an attempt to support the contention that the double axe was a battle axe as well as a tool, upon closer examination all but one have as little to stand on with reference to the Aegean as do those who would vehemently deny this function of the double axe.

If one is to get at the truth behind all this supposition it is necessary first to clear out all the assumptions and regard only the bare archaeological facts in their contexts and the literary evidence; most of the suggestions by the modern scholars need to be examined very closely before being used in support of one position or the other. In this case, of course, unlike the woodworking and masonry functions, there are no modern parallels for the use of the double axe as a weapon of war. In fact, the double axe as a weapon died out.

⁸²Snodgrass, 166.

⁸³Snodgrass, 166-67. Snodgrass goes on to conclude, in relation to the time he is studying, "...the consideration of the finds, in conjunction with the two Homeric passages, make it a reasonable contention that in the somewhat irregular style of warfare of the Dark Age, the battle-axe was among the weapons known to the Greek warrior". (Snodgrass, 166.)

before the Middle Ages with the introduction of better swords. The single axe was used from time to time but pole axes and the like (for use on horseback especially) became the main form of axe used in later military action. The exception to this was the single-edged drooping battle axe of the Nordic and Germanic peoples. The individual fighting style as well as the fierceness and devastating effectiveness of the axe when a blow connects, seem to have suited the military ideals of these peoples.⁸⁴

But even the most avid supporters of the axe as a weapon must admit, the double axe was not a widely used weapon. Unlike spearheads, daggers and swords, there is not a multitude of finds to work from. And the additional problem of determining which finds are tools and which are weapons makes the case for the axe as a weapon in the Aegean Bronze Age an even harder one to support definitely. But after examining the archaeological and literary evidence presented above one may draw a few conclusions.

The first is that the Aegean peoples of the Bronze Age knew about and manufactured battle axes in their hammer-bitted form. They also manufactured the double axe and were acquainted with its use in battle by the cultures surrounding the Aegean. The literary evidence, although some of it later than the Bronze Age, also supports the use of the double axe in battle. Taking these facts into account with the evidence we have reviewed, it is quite likely that a number of the finds mentioned above were actually double-bitted battle axes. Of course, more tablets with double axe ideograms could allow a more definite statement. At this point, however, that the axe

⁸⁴Wise, 25.

was probably manufactured as a weapon as well as a tool in the Aegean during the Bronze Age is as definite a statement as can be made.

CONCLUSION

This then completes the manufacturing and function analysis of the double-bitted axe in Aegean prehistory. The double axe was a natural step in the evolution of the axe as a vital implement to primitive man. Used throughout the Palaeolithic Age as an all purpose tool, the simple axe gradually evolved and, as tool specialisation began, so too did ideas such as the double tool, a hand held precursor to the double axe. With the advent of the Mesolithic era, and the monumental change in the landscape, the axe's chopping function was the focus of concentrated experimentation and improvement. Hafting had to develop so that the forests now covering the land could be cleared and the timber used for all the new industries evolving. An amazing variety of hafting techniques and new axe heads are adopted and discarded at this time. In this climate of experimentation, with the idea of the double tools in the backs of their minds, the tool makers come up with shaft-hole hafting, the technique which was eventually to enable the double axe to take its position at the forefront of Aegean implement manufacture and design. The introduction of metal set the seal on the ascendancy of the double axe. Copper technology eliminated the major failing of the double axe in stone, its fragility at the shaft-hole. It was, however, the introduction of bronze, with its easier casting ability and greater hardness that led to increased experimentation and the final form of the double axe with an oval shaft-hole and collared axe head. It is also at this time that variations in the types

of double axe head are introduced for the different, specific tasks to which this axe was applied.

In the Bronze Age then, the double axe reaches its peak of design potential. The only changes which would have to be made are those involving material unavailable to man at that time. These include iron for the axe head and a silica based holding compound which would attach the axe head more securely to the haft.

The developments in design and manufacture of the double axe having been described, the next step was explore the actual uses to which the axe was applied.

In Section Two we found that the woodworking industry of the Bronze Age was transformed by the introduction of the metal double axe. The bronze double axe, when compared with the stone axe or even the bronze single edged axe, enabled timber to be felled and prepared with greater speed and efficiency. The probable use of the double axe in shipbuilding also led to added speed and therefore production. While restricted in the finer areas of carpentry the axe was a useful tool in two other areas.

In the field of masonry it appears that, in Crete at least, the axe was indispensable. It performed the rough hewing of the stone in order to shape and prepare it for its eventual place in the palace wall design.

The axe's possible use as a slaughtering tool, whether for everyday and or ritual purposes, was backed very strongly by later literary sources. It was difficult to come to a very definite conclusion, however, as archaeological evidence could not be brought to bear on this function. Certainly the use of the axe in this manner

was not impossible and the simple fact that the double axe was used to hew timber and rock should not eliminate the possibility of its having been used on animals. It was, after all, the versatility of the axe which made it such an ideal tool in the first place. It is appropriate then, that from killing animals that the paper went on to examine the possible function of the double axe with regards its use in killing men.

Showing that the double axe could be and was used as a weapon, by civilisations in general, is not difficult, as there is abundant evidence from Asia and Europe, and Africa to support this claim. Applying this information to the Aegean was, however, quite difficult. This was partially due to the multiple uses of the implement. Many double axes have been found in the Aegean but enough details have not published, in relation to the contexts of the axe finds, in order to ascertain whether all were tools or whether some might have been weapons.

The literary evidence from the contemporary Linear B script seems to support this function of the axe as do examples from Homer and later writers. But while there is at least as much, and in some cases more, evidence here as there was for the other functions of the axe, the interpretation of the evidence has been plagued with problems. On the one hand, the majority of the Aegean scholars refuse to admit that the chief religious symbol of the "peaceful" Minoans could be a military weapon. On the other hand, the weapons scholars, not necessarily specialists in the Aegean, assume all double axes are weapons and do not usually consider that they might have been tools. Unfortunately all the above information has

come to us through one or the other side of this debate and so to achieve an accurate reflection of the axe's function in this matter is difficult. But it is not impossible. It is reasonable, reading the evidence with an eye to the attitude of the scholar reporting it, to conclude that the axe was probably used as a weapon in the Bronze Age, and definitely in the following Dark Ages to the Geometric period. There are however, two studies which need to be made, not just to substantiate that the axe was used in war, but to enable us to be fully informed about the evidence available to us on the double axe.

The first study would be to compile a full and accurate catalogue of all the double axe finds in the Aegean. This catalogue must contain, in addition to location, type and condition, detailed information on the context of the find. The other objects found with the axe and how these objects were located in relation to the axe would be the most vital part of the study. Of course I am aware that it will not be possible in all cases to reconstruct the evidence but enough could be worked out to give us some clues as to the possible function of particular axes in certain cases.

The second study would be to have a damage wear analysis done on those axes which seem to have been used. Different patterns should be shown by those axes used to hew timber versus wood, flesh or bronze armour.

It is clear from this thesis that the double axe played an extremely important and varied role in the Bronze Age of the Aegean. Its development from a weak implement in stone to an

efficient and superior axe in metal, as well as the many uses to which it was put, all testify to this conclusion. While this paper could be used as a basis for further study of the double axe in relation to its meaning and possible use in the Minoan (Mycenaean?) religion, the two studies mentioned above need to be done first. For until the full potential of the evidence which exists has been made available, any definite conclusions about the double axe's meaning to and possible use in Aegean Bronze Age religions would be premature.

BIBLIOGRAPHY

- Bocquet, Aimé
Houot, André "La Fabrication des Outils." Histoire et Archeologie, June 1964, Vol. 64, 39-55.
- Bordaz, Jacques "Tools of the Old and New Stone Age. 1958-9. (Revised Edition) New York: Natural History Press, 1970.
- Branigan, Keith "Aegean Metalwork of the Early and Middle Bronze Age. Oxford: Clarendon Press, 1974.
- "Early Aegean Hoards of Metalwork." Annual of the British School at Athens, 1969, Vol. 64, 1-11.
- "The Foundations of Palatial Crete. London: Routledge and Kegan Paul, 1970.
- "The Prehistory of Hieroglyphic Signs 12 and 36." Kadmos, 1966, Vol. 5, 115-117.
- "The Tombs of Mesara. London: Gerald Duckworth and Co. Ltd., 1970.
- Brezillon, M.N. "La Denomination des Objets de Pierre Taillee. Paris: Gallia Prehistoire, Supplement IV, 1968.
- Blümner, Hugo "Technologie und Terminologie der Gwerbe und Künste bei Griechen und Römern. Vol. II, Hildesheim: Georg Olms Verlagsbuchhandlung, 1969.
- Burrows, Ronald M. "The Discoveries in Crete. London: Kennikat Press, 1907.
- Capitan, Louis "Origine et Mode de Fabrication des Principaux Types D'Armes et Outils en Pierre." Revue Anthropologique, 1917, Vol. 27, 1-51.
- Charles, J.A. "Early Arsenical Bronzes." The American Journal of Archaeology, 1967, Vol. 71, 21-26.

- Childe, V.G. The Danube in Prehistory. Oxford: Clarendon Press, 1929.
- "Eurasian Shaft-hole Axes," Eurasia Septentrionalis Antiqua, 1934, Minns Vol. 9, 157-164.
- New Light on the Most Ancient Near East. (Revised Edition) London: Kegan Paul, Trench, Trubner and Co., Ltd., 1934.
- "Stone Battle Axes from Troy," Man, May 1924, No. 51, 66-68.
- Clifton-Taylor, Alec English Stone Building. London: Victor Gollancz Ireson, A.S.Ltd., 1983.
- Coghlán, H.H. "The Evolution of the Axe from Prehistoric to Roman Times," The Journal of the Royal Anthropological Institute, 1943, Vol. 73, 27-56.
- Cook, A. B. Zeus. A Study in Ancient Religion, Vol. II, Part. 1. New York: Biblo and Tannen, 1925.
- Courbin, Paul "Une Tombe Géométrique D'Argos," Bulletin de Correspondance Hellénique, 1957, Vol.81, 322-386.
- Davis, Simon The Decipherment of Minoan Linear A and Pictographic Script. Johannesburg, Witwaters Rand University Press, 1967.
- Deonna, Waldemar "Haches, Broches et Chenets dans une Tombe Géométrique D'Argos," Bulletin de Correspondance Hellénique, 1959, Vol. 83, 247-253.
- Deshayes, Jean Les Outils de Bronze de L'Indus au Danube. Vols. I-II, Paris: Librairie Orientaliste Paul Geuthner, 1960.

- Doumas, Christos Early Bronze Age Burial Habits in the Cyclades. Studies in Mediterranean Archaeology, Vol. XLVIII. Sweden: Paul Åströms Förlag, 1977.
- Evans, Arthur J. The Earlier Religion of Crete in Light of the Cretan Discoveries. London: MacMillan and Co., Ltd., 1931.
- "Mycenaean Tree and Pillar Cult," The Journal of Hellenic Studies, 1901, Vol. 21, 106-113, 178.
- Evans, John The Ancient Stone Implements, Weapons and Ornaments of Great Britain. (Revised edition) London: Longmans Green and Co., 1897.
- Gimbutas, Marija "Battle Axe or Cult Axe?" Man, April 1953, Nos. 72-73, 51-54.
- Graham, James W. The Palaces of Crete. New Jersey: Princeton University Press, 1969.
- Halliday, W.R. The Greek Questions of Plutarch. New York: Arno Press, 1975.
- Harding, Anthony Young, Robert "The Hafting Methods and Functions of Stone Implements," in Stone Axe Studies. (Editors: T.H. McK Clough and W.A. Cummins) London: Council for British Archaeology, Research Report No. 23, 1979, 102-105.
- Hawkes, C. "Double Axe in Prehistoric Europe," Annual of the British School at Athens, 1936-7, Vol. 37, 141-159.
- Healy, John F. Mining and Metallurgy in the Greek and Roman World. London: Thames and Hudson, 1978.
- Herodotus The Histories - VII. (Notes by Agnata F. Butler) London: MacMillan and Co., Ltd., 1899.

- Higgins, Reynold The Greek Bronze Age, London: Trustees of the British Museum, 1970.
- Higgs, E.S. "The Stone Industries of Greece," La Préhistoire: Problèmes et Tendances, Paris: Editions du Centre National de la Recherche Scientifique, 1968, 223-235.
- Hodge, A.T. "The *Labrys*: Why was the Double Axe Double?" American Journal of Archaeology, 1985, Vol. 89, 307-308.
- Homer The Iliad, (Notes by D.B. Monro) Vol. II (Revised Edition) Oxford: At the Clarendon Press, 1893.
- The Iliad, (Notes by Walter Leaf and M.A. Bayfield) London: MacMillan and Co., Ltd., 1962.
- The Odyssey, (Notes by W.W. Merry) Vol. I Oxford: At the Clarendon Press, 1878.
- Hutchinson, R.W. "Battle-axes in the Aegean," The Proceedings of the Prehistoric Society, 1950, Vol. 15, No. 4, 52-65.
- Prehistoric Crete, (Revised Edition) London: Cox and Wyman Ltd., 1968.
- Iverson, Johannes "Forest Clearance in the Stone Age," Scientific American, March 1956, Vol. 194, 36-41.
- Keller, Charles M. "The Development of Edge Damage Patterns on Stone Tools," Man, (New Series) 1966, Vol. 1, No. 4, 501-511.
- Lamb, Winifred Excavations at Thermi in Lesbos, Cambridge: At the University Press, 1936.

- Lang, Andrew "Homer and Anthropology," in Anthropology and the Classics. (Editor: R.R.Marett) Oxford: At the Clarendon Press, 1908.
- Long, Charlotte R. The Ayia Triadha Sarcophagus. Studies in Mediterranean Archaeology, Vol. XLI, Göteborg: Paul Åströms Förlag, 1974.
- Lorimer, H.L. Homer and the Monuments. Oxford: At the University Press, 1946
- Lubbock, J. Pre-historic Times. (Revised Edition) London, 1878.
- MacCurdy, George G. "The Cult of the Ax," Holmes Anniversary Volume: Anthropological Essays. Washington: J.W Bryan Press, 1916. (Reprint) A.M.S. Press Inc., 1977, 301-315.
- Maindron, G.R.M. Les Armes. Paris: Librairies Imprimeries Reunies, 1890.
- Mallowan, M.E.L.
Cruikshank Rose, J. Prehistoric Assyria: The Excavations at Tall Arpachiyah - 1933. London: Oxford University Press, 1935.
- Mavriyannaki, C. "La Double Hache dans le monde Hellenique à L'age du Bronze," Revue Archæologique, 1983, Vol. 2, 195-228.
- Meiggs, Russell Trees and Timber in the Ancient Mediterranean World. Oxford: Clarendon Press, 1982.
- Mylonas, G.E. Mycenae and the Mycenaean Age. New Jersey: Princeton University Press, 1966.
- "Three Late Mycenaean Knives," American Journal of Archaeology, 1962-3, Vol. 66, 406-408

- Neuburger, Albert The Technical Arts and Sciences of the Ancients. (Translated by Henry L. Brose) London: Methuen Co., Ltd., 1930.
- Nilsson, Martin P. The Minoan-Mycenaean Religion and its Survival in Greek Religion. (Revised Edition) Lund: C.W. Gleerup, 1968.
- Oakley, Kenneth P. Man the Tool-maker. London: British Museum, 1963.
- Orlandos, A. Les Matériaux de Construction et la Technique Architecturale des Anciens Grecs. Vol. I (Translated by Vanna Hadjimichali) Paris: Editions E. de Boccard, 1966.
- Palmer, L.R. The Interpretation of Mycenaean Greek Texts. Oxford: At the Clarendon Press, 1963.
- Pernier, Luigi
Banti, Luisa Il Palazzo Minoico di Festòs; Il Secondo Palazzo. Vol. II. Rome: La Libreria Dello Stato, 1952.
- Petrie, Sir W.M.F. Tools and Weapons. London: The British School of Archaeology, 1917.
- Piggott, Stuart "Bronze Double-axes in the British Isles," The Proceedings of the Prehistoric Society, 1953, Vol. 19, 224-226.
- "The Early Bronze Age in Wessex," The Proceedings of the Prehistoric Society, 1938, Vol. 4, No.3, 52-106.
- Quennell, M. Everyday Life in Prehistoric Times. (Revised Edition) London: B.T. Batsford Ltd., 1959.
- Renfrew, Colin "Cycladic Metallurgy in the Aegean Bronze Age," American Journal of Archaeology, Vol. 71, No. 19, 1-20.

- The Emergence of Civilisation. The Cyclades and the Aegean in the third Millenium B.C. London: Methuen and Co., Ltd., 1972.
- Rouse, W.H.D. "The Double Axe and the Labyrinth," The Journal of Hellenic Studies, 1901, Vol. 21, 268-274.
- Salaman, R.A. Dictionary of Tools used in Woodworking and Allied Trades, c. 1700-1970, London: George Allen and Unwin Ltd., 1975.
- Sankalia, Hasmukh D. Stone Age Tools, Poona: Deccan College, 1964
- Smith, Reginald A. "The Perforated Axe-hammers of Britain," Archaeologia, 1926, Vol. 75, No. 77, 77-108.
- Snodgrass, Anthony Early Greek Armour and Weapons, Edinburgh; Edinburgh University Press, 1964.
- Sonnenfeld, J. "Interpreting the Function of Primitive Stone Implements," American Antiquity, 1962, Vol. 28, No. 1, 56-65.
- Stone, George C. A Glossary of the Construction, Decoration and Use of Arms and Armour, New York: Jack Brussel, 1934.
- Thompson, R.H.G. "The Medieval Artisan," in A History of Technology, Vol. II. (Edited by C. Singer, E.J. Holmyard, A.R.Hall) Oxford: At the Clarendon Press, 1954, 383-396.
- Tylecote, R.F. A History of Metallurgy, London: The Metals Society, 1976.
- "Summary of Results of Experimental Work on Early Copper Smelting," in Aspects of Early Metallurgy, (Editor W.A. Oddy) London Historical Metallurgy Society and British Museum Research Laboratory, 1977, 5 12.

- Van Black, L.H. Elements of Materials Science. (Fifth Edition) Massachusetts: Addison Wesley Pub., Co., Inc., 1985.
- Ventris, Michael
Chadwick, John Documents in Mycenaean Greek. 1956 (Revised Edition) Cambridge: University Press, 1973.
- Velinden, Colette "La Métallurgie Minoenne et la fonte à la Cire Perdue," Bulletin de Correspondance Hellenique, 1986, Vol. 110, 41-52.
- Vermeule, Emily Greece in the Bronze Age. Chicago: University of Chicago Press, 1964.
- Wace, A.J.B. Excavations at Mycenae 1939-55. (Editor: E. French) London: Thames and Hudson, 1979.
- Waites, Margaret C. "The Deities of the Sacred Axe," The American Journal of Archaeology, 1923, Vol. 27, 25-56.
- Warren, Peter The Aegean Civilizations. Lausanne: Elsevier Publications, 1975.
- "Knossos: New Excavations and Discoveries," Archaeology, July/August 1984, Vol. 37, No. 4, 48-55.
- Watson, William Flint Implements. London: Trustees of the British Museum, 1950.
- Webb, W.L.
Gibson, W.H. "Stone Masonry and Plain Concrete Construction," in Cyclopedia of Architecture, Carpentry and Building. Chicago: American Technical Society, 1912, 95-184.
- Winteringham, T. The Story of Weapons and Tactics. New York: Books for Libraries Press, 1943.
- Willcock, Malcolm M. A Companion to the Iliad. Chicago: At the University Press, 1976.

Willetts, R.F.

Cretan Cults and Festivals. London: Routledge and Kegan Paul, 1962.

Wise, Terence

Saxon, Viking and Norman. Men-At-Arms-Series. (Editor Martin Windrow) London: Ospray Publishing, 1979.

FIGURE ACCREDITATION

<u>Source</u> ¹	<u>Figure(s)</u>
Bocquet & Houot:.....	10b, 26.
Bordaz:.....	1a, 1b, 4a, 4b, 5a, 5b, 8, 9, 10a, 11, 15a, 15b, Time Chart in Appendix A i.
Branigan:	
<u>Aegean Metalwork</u>	33.
Coghlan:	6, 7, 20b.
Davis:	Appendix B ii.
Deshayes:	28, 35, 36, Appendix C.
Healy:	19.
Higgins:.....	Appendix A ii
Hutchinson:	
"Battle Axes...".....	38.
Long:.....	34.
Mavriyannaki:	24, 25.
Neuburger:	29.
Oakley:	2, 3.
Petrie:	20a, 28, 37.
Renfrew:	
<u>Emergence of Civilisation</u>	16, 17.
Salaman:	27, 30, 31, 32, Appendix D ii.
Smith:	14.

¹For complete bibliographical information on the sources listed please refer to the Bibliography, pages 153-160.

Tylecote:

Ancient Metallurgy.....18.

Ventris & Chadwick:Appendix B i.

Watson:12, 13.

Wise:39.

Note: The figures in the Catalogue and the diagram
in Appendix D ii were drawn by A. Douglas MacKinnon,
using the Apple Macintosh..

APPENDIX A

TIME CHARTS

YEARS AGO (X 1000)	GLACIATIONS (ALPS)	GEOLOGICAL DIVISIONS	ARCHAEOLOGICAL DIVISIONS
10	Postglacial	Holocene	Neolithic Mesolithic
35	Würm	Upper Pleistocene	Upper Paleolithic
75			Middle Paleolithic
100			
200	Riss	Middle Pleistocene	
275			
	Mindel		
		Lower Pleistocene	
500			
	Günz		Lower Paleolithic
		Basal Pleistocene	
2000	Donau and Earlier Stages		

A i: Chronology of the Glaciations and Early Prehistory

	CRETE	CYCLADES	GREECE		EGYPT
3000					Dynasty I
2900					
2800	E.M. I	E.C. I	E.H. I		II
2700					
2600				OLD KING- DOM	III
2500					IV
2400	E.M. II	E.C. II	E.H. II		V
2300					VI
2200					
2100	E.M. III	E.C. III	E.H. III	1st INTER- MEDIATE	VII-X
2000	M.M. I			MIDDLE KING- DOM	XI
1900		M.C. I			XII
1800	M.M. II	M.C. II	M.H.		
1700				2ND INTER- MEDIATE	XIII-XVII
1600	M.M. III	M.C. III			
1500	L.M. Ia		L.H. I		
	L.M. Ib		L.H. II	NEW KING- DOM	XVIII
	L.H. II				
1400	L.M. IIIa		L.H. IIIa		
1300	L.M. IIIb		L.H. IIIb		
1200	L.M. IIIc		L.H. IIIc		XIX-XX
1100					
	SUBMINOAN		SUBMYCENAEAN		XXI
1000					

A ii: Chronology of the Aegean Bronze Age

APPENDIX B
BRONZE AGE SCRIPTS

H	A	B	H	A	B	H	A	H
L. 1 AB 18			L. 44 AB 11			L. 76 AB 40

L. 2 AB 4			L. 45 AB 61			L. 77 AB 38
	L. 6 AB 41			L. 47 AB 63			L. 78 AB 10
	L. 9, 11, 28 AB 12			L. 80, 122 AB 12			L. 79 AB 119

L. 10 AB 9			L. 51 AB 11			L. 81 AB 15
	L. 13 AB 5			L. 52 AB 14			L. 82 AB 12

L. 16 AB 54			L. 53 AB 61			L. 83 AB 62
	L. 21 AB 54			L. 54 AB 54			L. 84 AB 55

L. 22 AB 5			L. 55 AB 52			L. 85 AB 63

L. 23 AB 57			L. 56 AB 12			L. 86 AB 39
	L. 24 AB 57			L. 57 AB 57			L. 87 AB 55
	L. 25, 27 AB 19			L. 58 AB 58			L. 88 AB 70
	L. 26 AB 55			L. 59 AB 11			L. 89 AB 21

L. 27 AB 57			L. 60 AB 11			L. 90 AB 5

L. 28, 56 AB 12			L. 61 AB 55			L. 91, 97 AB 56
	L. 29 AB 23			L. 62 AB 35			L. 92 AB 25
	L. 30 AB 11			L. 63 AB 72			L. 93 AB 10

L. 31 AB 27			L. 64 AB 55			L. 94 AB 60

L. 32 AB 20			L. 65 AB 81			L. 95 AB 11
	L. 33 AB 8			L. 66 AB 97			L. 96, 128 AB 89

L. 34 AB 29			L. 68 AB 61			L. 97, 100/38 AB 37

L. 35 AB 69			L. 69 AB 11			L. 98 AB 56
	L. 37, 116, 20 AB 35			L. 72 AB 21			L. 99, 102 AB 15
	L. 39 AB 7			L. 71 AB 11			L. 103 AB 53
	L. 41 AB 67			L. 75 AB 21			L. 120 AB 116

B i: Aegean Bronze Age Scripts

H = Hieroglyphics A = Linear A B = Linear B

Clothing in Linear B					
150 M		150 PU		150 TA	
151 M		151 L		151 R	
152 M		152 L		152 TA	
153 L		153 PU		153 TA	
154 L		154 C		154 TA	
155 L		155 L		155 TA	
156 L		156 L		156 TA	
157 L		157 U		157 TA	
158 L		158 U		158 TA	
159 L		159 U		159 TA	
160 L		160 U		160 TA	
161 L		161 U		161 TA	
162 SC		162 U		162 TA	
163 SC		163 U		163 TA	
164 L		164 U		164 TA	
165 L		165 U		165 TA	
166 C		166 U		166 TA	
167 C		167 U		167 TA	
168 P		168 U		168 TA	
		Vessels		Chariots	
		200 L TO		200 L TO	
		201 TO		201 TO	
		202 TO		202 TO	
		203 TO		203 TO	
		204 TO		204 TO	
		205 L TA		205 L TA	
		206 L TA		206 L TA	
		207 L TA		207 L TA	
		208 L TA		208 L TA	
		209 L TA		209 L TA	
		210 L TA		210 L TA	
		211 L TA		211 L TA	
		212 L TA		212 L TA	
		213 L TA		213 L TA	
		214 L TA		214 L TA	
		215 L TA		215 L TA	
		216 L TA		216 L TA	
		217 L TA		217 L TA	
		218 L TA		218 L TA	
		219 L TA		219 L TA	
		220 L TA		220 L TA	
		221 L TA		221 L TA	
		222 L TA		222 L TA	
		223 L TA		223 L TA	
		224 L TA		224 L TA	
		225 L TA		225 L TA	
		226 L TA		226 L TA	
		227 L TA		227 L TA	
		228 L TA		228 L TA	
		229 L TA		229 L TA	
		230 L TA		230 L TA	
		231 L TA		231 L TA	
		232 L TA		232 L TA	
		233 L TA		233 L TA	
		234 L TA		234 L TA	
		235 L TA		235 L TA	
		236 L TA		236 L TA	
		237 L TA		237 L TA	
		238 L TA		238 L TA	
		239 L TA		239 L TA	
		240 L TA		240 L TA	
		241 L TA		241 L TA	
		242 L TA		242 L TA	
		243 L TA		243 L TA	
		244 L TA		244 L TA	
		245 L TA		245 L TA	
		246 L TA		246 L TA	
		247 L TA		247 L TA	
		248 L TA		248 L TA	
		249 L TA		249 L TA	
		250 L TA		250 L TA	
		251 L TA		251 L TA	
		252 L TA		252 L TA	
		253 L TA		253 L TA	
		254 L TA		254 L TA	
		255 L TA		255 L TA	
		256 L TA		256 L TA	
		257 L TA		257 L TA	
		258 L TA		258 L TA	
		259 L TA		259 L TA	
		260 L TA		260 L TA	
		261 L TA		261 L TA	
		262 L TA		262 L TA	
		263 L TA		263 L TA	
		264 L TA		264 L TA	
		265 L TA		265 L TA	
		266 L TA		266 L TA	
		267 L TA		267 L TA	
		268 L TA		268 L TA	
		269 L TA		269 L TA	
		270 L TA		270 L TA	
		271 L TA		271 L TA	
		272 L TA		272 L TA	
		273 L TA		273 L TA	
		274 L TA		274 L TA	
		275 L TA		275 L TA	
		276 L TA		276 L TA	
		277 L TA		277 L TA	
		278 L TA		278 L TA	
		279 L TA		279 L TA	
		280 L TA		280 L TA	
		281 L TA		281 L TA	
		282 L TA		282 L TA	
		283 L TA		283 L TA	
		284 L TA		284 L TA	
		285 L TA		285 L TA	
		286 L TA		286 L TA	
		287 L TA		287 L TA	
		288 L TA		288 L TA	
		289 L TA		289 L TA	
		290 L TA		290 L TA	
		291 L TA		291 L TA	
		292 L TA		292 L TA	
		293 L TA		293 L TA	
		294 L TA		294 L TA	
		295 L TA		295 L TA	
		296 L TA		296 L TA	
		297 L TA		297 L TA	
		298 L TA		298 L TA	
		299 L TA		299 L TA	
		300 L TA		300 L TA	

B ii: Mycenaean Linear B Ideograms

APPENDIX C

MAP OF DOUBLE AXE FINDS

○ doubles haches	A	□ haches-herminettes, A
●	B	■
×	C	△
+	divers	▲
▽ doubles haches		+
		○ pioches

(Double Axe Finds in the Aegean (1969)

APPENDIX D

GLOSSARY AND AXE DIAGRAM

GLOSSARY

Abbevillian Technique

A method of stone tool manufacture in which the core is struck with a rock in order to flake off pieces and shape a tool. This method involves direct percussion.

Acheulean Technique

A stone knapping technique involving indirect percussion. The tool-maker holds a stick or bone on top of the core and strikes this (instead of striking the core itself) in order to remove flakes and shape the tool.

Adze

A blade set transversely on a handle. The user must be working on an object below his waist level. The adze is swung down and across to chip or "flake off" pieces of wood. The adze is used to trim or partially plane a wooden surface. It can also be used as a type of gouge, e.g. for hollowing out a log.

Annealing

In this process a metal is heated from 0.3 to 0.6 of its melting point, maintained at this temperature for a short time, then allowed to cool. This procedure restructures the metal, restoring any embrittling caused by cold working.

Antler Sleeve

A hollow socket of bone which is fit to a stone axe head before the latter is inserted into a wooden handle. The sleeve absorbs most of the shock from the repeated blows during the use of the tool. It therefore extends the life of the wooden handle.

Ashlar Masonry

A technique of wall construction which uses large squared stones.

Axe

A tool with the cutting edge set parallel to its handle.

-double: An axe with the shaft set in the centre of the head such that there are two cutting edges, one extending from either side of the handle.

-flat: This is a simple metal axe, without shaft-hole. It must be attached to the handle by binding and or inseting the blade into the wooden handle.

-hammer-buttet: This type of axe has a butt which extends out from the handle much like the second blade of double bladed axe. The butt is rounded, however, not sharp, somewhat like a

hammer. Both ends are usually drooping down towards the base of the handle. This type of axe was used as weapon.

shipbuilder's: The blades of this axe are very long and heavy in order to give the maximum strength and depth to each blow. It is used for trimming timbers and masts in shipbuilding.

- **wedge felling:** An axe with a smooth narrow blade which thickens (or swells) dramatically at the butt. Used for felling trees because its design gives a deep bite but is easy to remove from the cut.

Bit

The blade or cutting edge of the axe. (See Appendix D ii)

Bite

- n. The cut created by the axe chopping wood from a tree.
- v. To chop at or cut a tree with an axe.

Borer

A Stone Age punch used to make small holes in leather or bone.

Brinell's Scale

A scale for the comparison of the hardness of metals. A steel ball is pressed into a metal for a given time and under a given load. The indentation is then measured. The scale ranges from 10 (lead) to 700, with 600 being heat-treated steel.

Bronze

A copper alloy, consisting of copper and either 10% tin or up to 7.8% arsenic.

Bronze Age

The time in prehistory where the majority of tools and weapons were made of Bronze. In the Aegean area the Bronze Age was ca. 3000-1000 BC. (See Appendix A ii)

Burin

A blade with the sides cut obliquely at one end, like a chisel. Used to engrave bone, antler wood and soft stone.

Butt

The end of an axe blade opposite the cutting edge.

Casting

- n. The hardened object left when a mould is split.
- v. Putting molten metal into a mould to harden.

Celt

An alternate term for a hand axe. It refers to the stone axe without a handle.

Chalcolithic

A period in prehistory during which the change from stone to metal technology takes place. Copper casting begins, but stone is still the dominant material used to make tools and weapons. In the Aegean the Chalcolithic period ranged from 4800-3000 BC.

Chert

An igneous rock, similar to flint in hardness.

Clay Core

A hardened clay stick which is laid in grooves cut specifically for this object in a closed mould. When the metal is poured into the mould it surrounds this "core", resulting in an empty space (the shaft-hole) in the finished casting.

Coldworking

The process whereby a metal is hammered in a cool solid state. This hardens the metal and changes its mechanical properties. The more the metal is hammered in this condition, however, the less malleable it becomes. If the process is taken too far the metal will not simply change shape, it will crack, unable to bear the stress any longer.

Core

The piece of rock from which a stone tool was made. At first this involved knocking off bits of stone until the desired shape was achieved. In later stone knapping techniques, however, the core was prepared such that the pieces flaked off were the desired products.

-discoid: A core prepared in a disc shape in order to produce broad flat flakes or blades.

-truncated: A core prepared in a cone shape in order to produce long thin blades.

Crucible

A fire-resistant container made of clay or stone. The crucible holds the metal as it changes from a solid to a liquid state during the process of refinement or simple melting.

Double Axe

See Axe, double.

Double-bitted Axe

See Axe, double.

Double-bladed Axe

See Axe, double.

Dressing

1. The preparation of a metal mould prior to casting. The mould is prepared by holding it over burning oil so that smoke leaves a residue on the matrix of the mould.
2. In stone masonry, the preparation of a stone slab or block. The axe is used first to roughly shape the stone, while the chisel often followed for finer work on the side of the block to be exposed to view.

Flint

An igneous rock used by early man for the majority of his stone tools due to its hardness and its small grain structure which enabled homogeneous flaking.

Flat Axe

See Axe, flat.

Haft

The bone or wooden shaft upon which an axe head is mounted.

Hammer-butted Axe

See Axe, hammer-butted.

Hoard

An archaeological term describing the find of a group of related objects. These objects were gathered together by someone in the past and represent the the valuables (be they the tools of trade or precious metals) of that person. Hoards were often a hidden cache, collected in times of trouble, for which the owner never returned and his or her contemporaries never discovered.

- carpenter's hoard: A collection which consists solely of carpenter's tools.
- metal hoard: A group of miscellaneous objects all made from metal.
- founder's hoard: A group of implements from a foundry and often some of the tools the smith was working on at the time the hoard was collected.

Ideogram

A character in early writing forms which represents an actual object, as opposed to an idea or a sound or a group of sounds. It is an actual picture of an object.

Knapping

A process in the making of stone tools which involves knocking off flakes by means of indirect percussion.

Knee-shaft Mount

A method of hafting an axe head in which the haft is a limb with a fork left roughly at a right angle to the main stem. The axe head is tied on to this outcropping.

Levallois Technique

This is a stone knapping technique in which the core is prepared by careful flaking so that, when struck properly, a whole blade can be removed. The major flake then, or blade, is the intended tool, not what is left of the core when the blades have been removed.

Lopping

A logging term for the trimming of branches off a felled tree.

Lugs

These are metal flanges deliberately incorporated in the casting of a flat axe. They are located at the top and bottom of the butt end of the axe head. When hafting, the whole butt is inset into the wooden handle and cords can be tied securely over the lugs without having to travel across the blade of the axe.

Lyngby Axe

An type of axe found first in Lyngby, Germany. This is an antler axe with a projection of bone at right angles from a straight haft. It can only be used for light work but is a precursor of the hafted axe.

Melt

To change a metal from its solid to its liquid state.

Mesolithic

A period in prehistory after the retreat of the last glacier. The first forests begin to appear, animal life is greatly changed and man moves from nomadic to a more settled way of life. There is not a specific time with regards the whole Aegean for this phase. It began some time after 8000 B.C. and ended with the introduction of new stone technology, the Neolithic Age, ca. 4000 B.C.

Mould

The shaped container into which molten metal is poured and left to harden in order to produce a cast object. The mould can be made of stone, clay or metal and comes in two varieties:

- open: A mould which casts only one side of an item. The metal is poured into a matrix carved on a flat surface (usually stone) and so one side of the casting is left "open" to the air.
- closed or bi-valve: A mould comprised of two pieces with one side of the item to be cast carved into each piece. The two halves are place together and the molten metal is poured through an opening in the top of the mould. In this fashion the casting is "closed" away from the air and the whole item is cast.

Neolithic

A period in prehistory during which an agricultural lifestyle is established, animals are domesticated and stone tools are polished instead of simply being chipped. In the Aegean the Neolithic Age ranges from 4000 to 3000 BC.

Ovates

Disc shaped stone implements from the Palaeolithic Era whose entire circumference is a sharpened edge. Because there is no hafting at this time, and such an implement would be useless in the bare hand, anthropologists believe that the ovates were used as missile weapons.

Palaeolithic

The first era in the prehistory of man. It is marked by the deliberate shaping of stone implements. In the Aegean the Palaeolithic Era ended ca. 8000 B.C.

Percussion Bulbs

These are the scars left behind after a flake has been chipped off of a stone core. They are a slightly depressed disc-shape and form ridges all over the surface of the tool.

Poll

The area around the shaft-hole of the axe. (See Appendix D ii)

Register

To place two halves of a closed mould together, carefully aligning the marks and vents on the outside of the mould so that inner matrix is exactly positioned.

Riser

A baked clay funnel or cup which is placed on the top of a closed mould. The molten metal, after passing through the runner (see below) and matrix is pushed up into this cup. The riser serves as a vent and, when full, as an indication to the caster to stop pouring the metal into the runner. It is also a

receptacle for the metal which would pick up the most gases and which therefore must clear the matrix so as not to be included in the finished implement.

Roasting

This is a process whereby a copper sulphide is reduced to a copper oxide by dry heating it in a furnace. Copper oxide is easier to smelt for casting purposes.

Rubble Masonry

A type of wall construction using rough irregularly shaped stones.

Runner

This is a clay funnel or cup used in closed moulding. The runner is placed in a hole on the top of the mould and the molten metal is poured through it into the matrix. The runner not only facilitates the entry of the metal, it also must be of sufficient height to create a pressure head in order to push the unwanted gases out of the mould ahead of the liquid metal.

Shaft-hole

A hafting method which involves drilling or casting a hole in the head of the axe. The shaft is then inserted into this hole.

Slag

The waste material from a smelting operation. An ore is made up of metals and gangue, the rock or other impurities which surround the desired metal. The smelting process separates the two ending up with molten metal and molten impurities. The term for these impurities is slag.

Slot Haft

This is a type of axe haft. It is made from wood and has a hole or slot cut in the top half of the shaft. The axe head is wedged into this slot.

Smelting

This is the process of refining a metal ore to separate the metal from its impurities (the gangue).

Socket Haft

A type of axe haft. This haft is made from an antler with the right angle projection hollowed out so as to form a socket for the stone axe head. It is not a very durable haft.

Splayed

This refers to the crescent shape of the sharpened axe blade edge after an axe has been coldworked. It is especially pronounced in copper axes as this metal required more hammering for hardening purposes than did bronze.

Squaring

This is a process whereby a tree trunk is trimmed and planed such that its edges and side are straight. This speeds the drying time of the wood and facilitates transportation. It also can be a preliminary step in making planks for architectural or ship construction.

Stop Ridge

In a slot hafted axe there is the danger of driving the axe head back through the hole in the handle. The stop ridge, usually made as part of the antler sleeve (see above) is fitted around the axe head before insertion into the slot hole. This ridge spreads the force of the blow over the edges of the slot, helping to disperse the stress which might otherwise split the haft.

Striker

This is a soft intermediary, such as bone or wood, used in knapping. The tool-maker hits the striker instead of the rock directly. In addition to decreasing the size of the percussion bulbs, the use of a striker enables the knapper to plan and place his blows very precisely.

Syllabary

A writing system in which the characters represent groups of sounds, or syllables.

Tamarisk

A hardwood tree.

Tuyere

A fire-hardened clay pipe which is inserted into the wall of a smelting furnace. Bellows are attached to the outside end and the tuyere guides the forced air into the furnace. Without this draught the temperature of the furnace could never be raised high enough to smelt metal.

Topping

As part of the preparation of timber for transport and use, the top of the tree (narrow with many small branches) must be cut off. This is known as topping.

Withy Hafting

This is a hafting method for double headed hammers. A flexible young tree branch bent around the stone head of an hammer. The two halves are then tied together. Usually a groove has been cut around the hammer head to hold the shaft in place. This is an awkward and weak mount for a stone tool.

D ii: Parts of the Axe

END

22.12.87

FIN