ANCIENT EGYPTIAN FURNITURE IN CONTEXT:
FROM ANCIENT PRODUCTION, PRESERVATION TO MODERN-DAY RECONSTRUCTION AND CONSERVATION.

by

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I declare that *ANCIENT EGYPTIAN FURNITURE IN CONTEXT: FROM ANCIENT PRODUCTION, PRESERVATION TO MODERN-DAY RECONSTRUCTION AND CONSERVATION* is my own work and that all the sources that I have used or quoted have been indicated and acknowledged by means of complete references.

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SUMMARY

The dissertation investigates the ancient Egyptian furniture industry, from ancient production and preservation, to modern-day reconstruction and conservation. The main focus of the dissertation falls on an in-depth investigation of styles and designs that can be viewed as characteristic/diagnostic of ancient Egyptian furniture. Emphasis falls on the evolution of functional and decorative elements and the development of individual items. Key design markers are identified and the developments of certain styles are traced. In-depth discussions reveal the finer structural and design elements of individual items along a chronological time frame. These include beds, stools, chairs, footrests, couches, mattresses and cushions, boxes and chests, tables, bed canopies and screens.

Introductory chapters provide the reader with background information relevant to the furniture industry, including tree species and timber properties, trade and import, tools, technologies and production methods, while the final chapter investigates the possible applications of modern technology for assessment, conservation and reconstructive purposes.

KEY WORDS/TERMS

Ancient Egyptian furniture
Wood
Timber
Trade
Carpentry
Carpentry tools
Furniture technology
Furniture conservation
Furniture assessment
Furniture styles

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I. PREFACE

To my husband, family and friends: thank you for all your support over the past 3 years. Without your help and encouragement I would not have been able to make it this far.

To my former colleagues at the Department of Anthropology: thank you for all the sound academic advice you gave me during my 2 year period at Unisa. I have grown substantially both as an individual and an academic.

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CHAPTER 1

INTRODUCTION

The Egyptians had a well-developed aesthetic sense, and even the objects they produced for everyday use had grace and style as well as meaning.

Hawass & Garret 2005: 61

Very few people today, while at work, at home or at play, realise to what extent wood plays a part in our everyday lives. Items of furniture are used on a constant basis, and whether made entirely of wood, or simply containing inserts or decorations thereof, few people stop and take notice of the raw material from which these items are manufactured. This blissfully unaware modern attitude stands in stark contrast to the awareness and appreciation of raw material held by the ancients.

The ancient appreciation of wood came partially from the mythology connecting wood species and forests to specific gods and goddesses, and partially from the observed physical attributes displayed by different timber types. Because of this interconnectedness between mythological and physical, and for us to fully comprehend and appreciate the true nature of Ancient Egyptian furniture, we have to place our study of wood within the ancient mythological context and within the 'godly botanical' (so to speak) context. We therefore have to understand why wood was important, which species were available to the ancient carpenter and what were the practical considerations relating to workability, durability and aesthetic appeal.

Once we have revealed the answers to the above-mentioned questions we have to ask ourselves where these timber resources came from. Once we start delving on this

question we realise that other raw materials, such as copper, ivory and turquoise, also had to make its way to the carpenter's workshop via trade routes.

Complex webs of local and international trade networks, crossing both land and sea, ensured that the constant supply for raw materials in Egypt was met. While raw materials made their way into Egypt, Egyptian furniture also found itself being exported to foreign nations as gifts or trade items. Ironically, some items were exported to the very regions from where their raw materials originally came.

Textual evidence from ancient trade documents and Biblical sources provide the supporting evidence behind the lucrative import and export of both raw materials and completed items of furniture. Although trade relations between foreign nations were intricate and complex, and often fluctuated across a vast chronological timeframe, it is important for us to understand where raw materials came from. Even if we cannot delve into the finer points of ancient trade, we should at least be aware of some of the main production regions, merchant centres, trade routes and transportation methods.

If we understand the great lengths to which the ancient carpenter went to acquire the desired raw materials, then perhaps we too shall develop a greater appreciation of the furniture we take for granted in our modern context.

In understanding ancient Egyptian furniture our key concerns revolve around technical matters. How did the ancient carpenter produce intricate works of technical and artistic mastery with the limited tools and skills available more than four millennia ago?

The ancient tool kit evolved over thousands of years and improved with the introduction of new, more durable metals. The durability and improved workability of new tools in turn led to the development of better production methods. If we are to understand these complex production methods, especially with regards to joinery, we first have to understand how new and improved tools influenced their creation. For example: intricate joints, such as common through dovetails, cannot be created by primitive flint blades, nor can they be created by blunt-nosed two-handed saws. Only with the introduction of the one-

handed pull-saw in the 1st dynasty could intricate production methods such as these be implemented.

An understanding of tool technologies and production methods is therefore of great importance to our study as it allows us to place different facets of the furniture industry within a chronological framework. In short, this allows us to provide relative dates for furniture items based on an analysis of methods and technologies. In addition, an understanding of these elements fosters greater modern-day affection for ancient furniture through an appreciation of ancient skill and technical prowess.

With the evolution of tools and production methods, and with the increased availability of desired raw materials, furniture items also underwent an evolutionary development. As a part of Ancient Egypt's material culture, furniture underwent numerous developments over the centuries, ranging from its inception as primitive utilitarian wares, to its adoption as a symbol of power and wealth. On all levels, whether technical, functional or decorative, Egyptian furniture was constantly evolving, developing from primitive form to royal grandeur.

Although furniture conformed to strict proportional guidelines, as was the case with art, creative expression was more evident in this form of material culture than it was elsewhere. Structural superiority was combined with decorative designs, with beauty and elegance equal in stature to that of royal jewellery. Shape was not only functional and decorative, but symbolic as well, an aspect modern design severely lacks in its composition.

In modern times, for example, decorative motifs rarely fulfil structural roles, while in ancient Egypt decorative elements often fulfilled dual purposes, serving both structure and symbology (Scott 1965: 142). Decorative images and symbols were carefully selected for both their mythological significance and visual pleasure (Hawass & Garret 2005: 61). In fact, motifs are rarely restricted to accomplishing aesthetic goals, but rather serve as creative illustrations of complex symbolic meanings and magical significance (Leospo 1987: 126).

Leonine furniture legs, for example, not only provide support to the item, but also represent royalty and social status. Armchairs may be decorated with lotus flowers or papyrus fronds, and their shape may provide physical support for the armrests, but their main attraction lies in their symbolic associations with the Nile River, agriculture, fertility and their respective representations of Upper and Lower Egypt.

Figures of bound captives were also used, not only providing structural support alongside the legs of the throne (as depicted by a relief in the tomb of Kha-em-het, Thebes, 1400 BC), but also personifying complex socio-political events, such as the defeat of foreign nations. In this regard, bound captives are often depicted kneeling before the throne of the Pharaoh, providing him with a human body footstool[1]. This reference is also recalled in the Bible in Luke 22: 43: *"...until I make thine enemies thy footstool."* Similarly, beds were not simply seen as utilitarian items, lifting the owner from the cold floor, but were also seen as a mark of civilisation.

The amount of time and effort spent in providing the dead with furniture tells us something about the importance these items held to the ancients. Not only were life sized favourites of the owner included in his or her grave, tiny models of carpenter's shops would provide the dead with all the items of furniture they might still come to need in the next world. These 'model' carpenters would manufacture model-sized items, which would become fully functional and 'normal sized' in the hereafter. By doing this the ancient Egyptians made sure that they would be provided with luxury and comfort in the next life. Furniture created within the funerary context thus possessed an additional layer of meaning, as it was required to aid the deceased in the afterlife (Hawass & Garret 2005: 61). Through a holistic study of ancient mythological, technological and aesthetic phenomena, we will gain a better understanding of the furniture industry within ancient Egypt.

[1] These symbolic images of triumph are often recreated in the decoration of royal footstools. See the later discussion in Chapter 6.

Despite our efforts in research, we still do not possess an adequate knowledge of ancient carpentry within our modern context. Therefore, new and exciting methods and techniques have to be considered. Our reasoning behind studies into non-destructive scanning techniques can be argued as follows:

> *None of the rich and varied testimony that has survived offers a complete picture of furniture manufacture. However, if this testimony is used together with observation of the objects themselves, made possible by scientific study, especially now with the application of non-destructive techniques, and the various types of information which can be gathered in the course of restoration work, one can attempt to follow the stages of manufacture.*
>
> *These images show only finished products or the making of individual parts, and not the various stages of manufacture of an entire object. They are, moreover, very stylised and conventional (e.g. certain materials are only used to make certain types of product). Production was surely much more varied and faceted.*
>
> Leospo 1987: 126

In studying ancient furniture through non-destructive scanning techniques we will be able to uncover hidden design characteristics that the ancients would perhaps have liked to keep as ‘trade secrets’. Not only that, but we will also be able to assess the current condition of ancient furniture items, reviewing both past treatments and prescribing new and improved applications for the future.

Thus said, our all-encompassing study of the numerous facets associated with the furniture industry, both ancient and modern, will be greatly welcomed by those conducting reconstruction and conservation work, by providing a complete picture of the furniture industry as a whole. The information will aid conservationists in maintaining authenticity when working with preserved artefacts, and guide modern carpenters in their production of life-like recreations of ancient originals.

1.1 HYPOTHESIS

Furniture may appear to some as a single aspect of a civilisation's material culture, but overall, the furniture industry as a whole presents us with a multifaceted and complex area of research. Although the furniture items themselves represent the main focus of such an investigation, various elements within the industry have to be considered, discussed and understood. These include technical (wood species, timber properties, tools, production methods and techniques), mythological, trade, as well as aesthetic elements (styles and designs).

With a greater understanding of the abovementioned elements we will be better equipped in endeavours focusing on ancient furniture assessment, restoration and conservation. Thus said, we will keep the following research questions as guiding points during our study of ancient Egyptian furniture:

1. What was the ancient carpenter's relationship with his most basic production material, wood? Did it hold mythological properties along with its physical properties? Also, can we identify timber properties and the wood species used in production?
2. How did international trade relations influence the availability and selection of raw materials, and is it possible to trace the origins of imported timber?
3. How did the ancient tool kit influence the production of furniture, and how can we identify the kinds of tools used during the manufacturing process?
4. What were some of the crucial steps taken during the manufacturing process and how will our understanding of production influence our appreciation of ancient carpentry?
5. What are the characteristic features of furniture from ancient Egypt, with regards to styles and designs?
6. Which modern technologies can be employed to assess ancient Egyptian furniture?

1.2 METHODOLOGY

Research will be done on existing literature surrounding furniture, both from an ancient and modern perspective. The knowledge of the ancients will be combined with the latest research on wood/timber identification, international trade, raw material properties, tool technologies, production methods, stylistic analysis and modern assessment technologies. Ancient textual references will also, from time to time, be used to support theories relating to specific topics, such as trade and import.

A large collection of images, originating from online museum databases from around the world, will also be incorporated into this dissertation and will mainly be used as a visual aid to describing and analysing certain characteristics of specific objects that, in many cases, have not been discussed in great detail by existing scholars.

1.3 LAYOUT

We will begin, in chapter 2, by briefly explaining the underlying mythological beliefs which promoted the acclaimed positions of certain timber species within the furniture production industry. The chapter then continues, on a more technical level, to define wood's desirability based upon physical characteristics. Discussions on sampling procedures and key timber properties will be concluded by an examination of individual wood species, their primary distribution areas and key characteristics. Many of the furniture examples mentioned in this chapter will be examined in finer detail in the chapter on styles and designs.

Chapter 3 investigates local and international trade, both via land and sea, in greater detail. Because trade was extensively documented in ancient times, either in textual or visual (paintings and reliefs) format, the chapter provides a wealth of selected texts and images as case studies. These case studies provide insight into various themes including forest

localities, messenger's accounts, gifts, tribute and raw material distribution. The chapter concludes by briefly delving into the realm of sustainable agriculture and the impact it could have had on ancient trade.

Chapter 4 begins by explaining the four primary steps within the over-all production process, namely: the felling of trees, followed by the sawing, stacking and drying of timber. The remainder of the chapter is dedicated to a technical overview of carpentry tools ranging from measuring instruments and honing tools, to saws, chisels and drills. An understanding of the evolution of the carpenter's tool kit, and its influences on production quality, will help us to better understand the developments made within the realms of production methods and technologies.

Chapter 5 is another technical chapter dealing with the manufacturing process. Here discussions mainly focus on structural support mechanisms such as joints, brackets, nails and metal hinges. The second half of the chapter looks as the aesthetic side of production, summarising decorative technologies such as faience, glass, upholstery and veneer. Our thoughts and theories on production culminate in a discussion on the carpenter's workshop: the production epicentre of the furniture industry.

The second-last chapter is, in essence, the core chapter of this dissertation. The evolution of furniture leg styles, and their crucial role within stylistic analysis, is explained as a general introduction to the chronological order by which the remainder of the chapter is arranged. Selected items are used as case studies in explaining the evolution of furniture items across the three most prominent phases of ancient Egyptian history, namely: the Old, Middle and New Kingdom. Patterns of development along with key period-related style characteristics and design markers are identified and evaluated in order to support the chronological development of furniture.

After a thorough understanding of the ancient furniture industry has been gained, chapter 7 provides an overview of the modern technologies used to analyse and assess ancient items of furniture. From the identification of wood species, the analysis of chemical compounds (for establishing raw material origin), the evaluation of wood microstructure and the assessment of internal furniture structures, modern non-destructive scanning techniques can further our understanding of ancient Egyptian furniture. In conclusion, the chapter explains how these technologies can be applied in our efforts to reconstruct and preserve our ancient heritage.

Author's notes

Images and Plates: *In-text pictures are referred to as Images and have relevant captions directly beneath the picture. Plates are colour pictures found in Appendix B. These Plates are clearly numbered and cited in-text. Plates can consist of either a single picture, or numerous related pictures within a collage. Where specific distinctions have to be drawn between pictures within these Plates they are accompanied by a short caption. Where further and more extensive descriptions are required to explain the meaning or subject matter of a picture, additional notes will be included as a footnote in the relevant section of text. The references for both Images and Plates can be found in Appendix C.*

In the electronic version of this thesis the links for all electronic resources will be active, allowing the reader to travel directly to the individual online source of images.

CHAPTER 2

WOOD AS THE PRIMARY CONSTRUCTION MATERIAL

Image 1: *Receiving nourishment from the 'the lady of the sycamore tree'.*

2.1 INTRODUCTION

The very essence of any item of furniture lies within the type of wood from which it is created. Without a proper understanding of the most basic construction material, we cannot fully appreciate ancient Egyptian furniture. The varying physical properties of timber influenced numerous factors such as workability, durability, longevity and aesthetic appeal.

Moisture levels and drying rates affected the preservation of furniture, while wood grain and density determined the finish of the final product. Furthermore, the introduction of foreign timber species directly impacted the development of new carpentry tools, methods and techniques. It is therefore of utmost importance that we identify the most readily available tree species used within the furniture industry and the multiple applications for which timber was utilised.

Not only the physical, but also the mythological, influenced the selection of certain species. Because of this, a holistic understanding of ancient Egyptian furniture will be incomplete without some understanding of the mythological context of ancient forests, wood and timber. We will therefore start our discussion on wood species with a brief overview of the mythological context of wood.

2.2 THE MYTHOLOGY OF WOOD

Wood itself not only represented the structural frame that gives shape to the item, but by extension also represented an array of mythological beliefs. Wooded areas and forests held sacred meaning to the ancients, representing the abode of the gods[2] from time immemorial. Forests stood as the natural temples of the gods and places of worship for humankind (Musselman 2003: 45), and as Hughes & Thirgood (1982: 72) describe it:

> *Groves of trees were sacred to the gods and forests were the original home of mankind... Many of the people in antiquity held that trees were inhabited by supernatural beings, or possessed souls of their own.*

Needless to say, if forests and groves held sacred meaning to ancient cultures, the trees and timber derived from these forests would also hold mythological significance. In Ancient

[2] For a further discussion on the abode of the gods refer to the section of wood species and forest localities in chapter 3.

Egyptian times, for example, the different species of wood were associated with different male and female deities[3] (*Plates 1-4*), the likes of which included Isis, Bes and Amon-Ra. It was also believed that certain gods preferred specific wood species and that trade to acquire timber was divinely inspired, as Hughes (1992: 21) writes:

> *Cedar wood from Mount Lebanon was called "a wood which the god (Amon Re) loves", so that journeys undertaken to secure it were believed to be commanded by the god.*

Along with these divine influences were embedded beliefs regarding fertility, rejuvenation, resurrection, creation and divine protection[4]. Additionally, some of the trees were believed sacred, placing restrictions on their use, thus ultimately preventing total deforestation[5] in Egypt (Hughes 1992: 19) Therefore, the wood in itself held symbolic and ritual meaning and was not simply viewed as a raw material of utilitarian value. In this regard, tying in with the words of Hughes & Thirgood (1982: 72), Berry (1930: 361) presents us with an alternate frame of mind when studying ancient resources:

> *Should we not then consider our trees as a part of our spiritual resources instead of purely an economic resource, and strive to get back a bit of that reverence of classic times when the forests were the abode of the gods?*

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[3] *Plate 1:* Image of Sinuhe, son of the sycamore fig, receiving nourishment from a tree. The goddess Hathor is closely associated with this species, and is often referred to as 'the lady of the Sycamore fig (*Glory of Ancient Egypt* 2002: *357*). The goddess Nut was also associated with this tree, and is often depicted as providing individuals with food and drink (*Glory of Ancient Egypt* 2002*: 383*). (*Also refer to Image 1*).
Plate 2: Decoration from the tomb of Thutmose III depicting Isis as a tree goddess (*Glory of Ancient Egypt* 2002: *382*).
Plate 3: A relief from the temple of Rameses II depicts both the Pharaoh and the goddess Seshat, one of the deities associated with writing.
Plate 4: This stele depicts the sycamore fig, which was often used to construct coffins (*Glory of Ancient Egypt* 2002: *383*).

[4] The thereomorphic shapes of bovine and leonine furniture legs served apotrapaic functions, in that their primary goal was to ward off evil (*Refer to the discussion in chapter 6 on the evolution of furniture leg styles*). In this instance we may go as far as to suggest that wood could have served a similar purpose. With a specific species of wood connected to a particular god or goddess it could have meant that the timber itself held some inherent apotrapaic properties. This theory leaves us with another avenue of future research.

[5] Also see the later discussion on sustainable agriculture, chapter 3

This close connection between man and nature is a notion we modern individuals might find strange, but as Roberts (2006: 1) puts it, this interconnectedness was a natural occurrence within ancient society:

> *It would seem natural to a civilization which worships the cosmological sacred tree that such a reverence for the tree developed out of ritualized worship of votive trees. Representing regeneration and immortality, the Sacred Tree was a symbol of the means to ascend to heaven.*

Even trade had a religious element, as many foreign cultures with which Egypt had trade relations rested a considerable amount of trade responsibilities upon temples and temple officials. To a similar extent, the same circumstances prevailed in Egypt. It is said that temple hierarchies controlled matters such as labour, craft specialisation (including the carpentry trade) and international trade (Knapp 1988: 44).

Moreover, the very survival of ancient Egyptian furniture can also be attributed to mythological factors. If not for the firm belief in life after death, the ancients would not have taken numerous items of daily life (including furniture) with them to their tombs (Baker 1966: 19). In fact, this belief dictated that everyday items and decorative objects must be placed in the tomb in order for the dead to enjoy the afterlife (Blakemore 2006: 13). Without the practice of storing these items in rock-cut tombs and mastabas, with their ideal climatic conditions[6], we would never have inherited the rich material culture central to this dissertation.

Keeping all of this in mind, before we can look at the production methods, we must first overview the production materials, as the materials themselves will influence these methods. An understanding of the basic materials of construction will help us to uncover

[6] These climatic conditions, and the impact of microbial agents of decay within tombs, are discussed in greater detail in chapter 7.

various aspects of woodwork and carpentry, both physical and mythological, and may even further our understanding of why certain types of wood were reserved for manufacturing specific items or components of furniture.

2.3 IDENTIFYING TREE SPECIES

> *The need to identify these materials comes from the need to understand their apparent and future deterioration patterns and inherent stability. This information will give the conservator a basis for logical decisions concerning conservation treatment, repairs, stabilization, and storage*[7]*.*
>
> Florian 1990: 29

From the mythological we now move on to the technical. Identifying the species of wood used in the production of ancient furniture is of utmost importance, as a number of factors would have been considered, taking due cognisance of the strength, durability, density, appearance and workability of the wood, as well as the natural availability of this resource. The timber properties would directly influence, not only construction in ancient times, but preservation until modern times. Thus said, wood properties will ultimately determine the suitability for a particular use (Bond & Hammer 2001: 3). Leospo (1987: 120) perhaps best describes why our understanding of wood species is of immeasurable value:

> *The introduction of different types of wood implies the development of new techniques and increased expertise among craftsmen. The knowledge of the various properties and potential of the different types of wood is revealed, for example, in the choice of different woods for various parts of the same object, according to the part's specific use.*

[7] Florian's words tie in well with the discussions on deterioration, conservation, chemical treatments and storage in chapter 7.

Furthermore, as mentioned earlier, the mythological properties attributed to the different species of wood might also give us some insight into the preference shown for certain species (*Plate 5*).

2.3.1 Sampling procedures

Each and every tree species, and the wood derived from it, possesses unique physical and mechanical properties (Bond & Hammer 2001: 3) that can be identified in order for us to differentiate between the different kinds of wood used in ancient furniture production. In this regard, the only way to positively identify the type of wood employed in the production of a particular item is by means of sampling. This is of even greater relevance if the wood has been treated or coated with certain substances, making the visible identification of the wood by the naked eye almost impossible. To expand upon this, the usual techniques for identifying wood types, such as flexibility and strength tests, cannot be conducted on ancient materials for obvious reasons. Taking samples to be tested under controlled conditions is thus our only viable option.

It is at all times advisable to take the smallest sample possible, so as not to damage or impair the structural integrity of the item, or interfere with the aesthetics of the artefact. Furthermore, one should at all times give valid and justifiable reasons why samples are required. In this regard, three main reasons are provided, namely: documentation, restoration, and conservation treatment (Florian 1990: 30).

Most commonly, photomicrographs (taken at transverse, radial and tangential geometric planes of reference) are used to investigate samples. Simply stated, photographs are taken by affixing a camera (film or digital) to a microscope emitting either transmitted or polarised light, thus allowing high magnification observations captured at a high resolution (Blanchette et al 1994: 58). These photomicrographs are then studied in order to identify the characteristic microscopic elements and wood anatomy of specific types of wood, such as

vessel pores, wood rays, tyloses, parenchyma (Bond & Hammer 2001: 7), cell wall thickness, growth ring width (Florian 1990: 75), resin canals, and other distinct morphological differentiations (Blanchette et al 1994: 59). By this means the specific type of wood can be positively identified using minute, and relatively non-destructive, samples. In addition, photomicrographs are not only useful in identifying the type of wood, but are also employed in identifying foreign elements such as preservation chemicals and fungi. (*More on this will be discussed in chapter 7.*)

2.3.2 Key timber properties

The strength of the lumber is directly determined by the density of the wood (*Table 1*). While a specific species will share general characteristics, some of these characteristics may vary within the same species. This is related to the fact that growing conditions, such as changing/fluctuating temperatures, will influence the growth rate of the tree, and by extension the density of the wood (Corbett 2007: 11).

Tropical hardwoods, because of their high density, experience severe levels of shrinkage, which could in turn lead to the formation of severe splits or cracks in the wood (Grattan 1989: 75). To add to this, when dealing with questions concerning moisture levels, the density of the wood also determines the electric properties of the wood, which in turn influence the accuracy of meter readings[8] (James 1988: 5). One should thus take the density of the wood into consideration when performing the moisture readings so crucial to the preservation of ancient furniture.

The ancient carpenter would have adapted or adjusted his workmanship based upon the properties and workability of the wood. How the wood ‘behaves’ when worked would have determined the type of tool used, and the durability required to work without bending

[8] Moisture levels and meter readings will be discussed in greater detail in chapter 7.

or breaking the tool. In ancient times the properties of timber were understood and the tools were developed to compensate for this (Killen 1994a:7).

Certain timbers have low cutting resistance, while others have blunting effects on tools. Ancient saws and chisels could possibly be examined in order to determine the level of 'wear and tear'. In this regard the grain of the wood is of utmost importance, and the ancient carpenter would probably have taken great care in cutting the timber in a manner that facilitated ease during crafting. A very short or close grain is difficult to work and can tear easily, especially if worked with a hand tool. Short- or cross-grained defects within the wood, such as checks[9], shakes, dead- and pin-knots, and reaction wood, would have been avoided as these defects can cause various problems during manufacture (Corbett 2007: 12).

The drying rate of timber would also have been considered, as insufficient drying would have influenced the long-term preservation of the item. The tree species itself, along with the climatic conditions of the region of growth, determines the borne-in moisture levels of the wood (Corbett 2007: 12). Needless to say, the drying time of timber is directly related to the moisture content of the wood (*See the further discussions on wood drying and seasoning, chapter 2*).

Another factor that may have influenced the preservation of wood from ancient times lies with the structure of the wood itself. Beneath the outer layer or bark of the tree lies the bast, which conducts the sugars manufactured in the leaves down towards the roots of the tree (Corbett 2007: 12). This layer is attractive to pests (Spirydowicz et al 2001: 44), and without the proper removal of the bast the wood would run a considerably high risk of damage. Although the ancient carpenter would have known little (or nothing) about the technical workings of the bast, and why it attracted insects, woodworkers would have learned from experience to remove both the bark and the bast from timber. Along with this,

[9] Checks on the outer surface are not serious as they can be cut out prior to production, while shakes within the interior of the wood are the result of stress and cannot be cut out easily (Corbett 2007: 13)

the durability of wood *(Table 2)* would have been a key factor in selecting the type of wood, considering the fact that certain types of wood possessed an inherent resistance to decay (Spirydowicz et al 2001: 45). This would have been of great concern, especially when it came to the manufacture of items intended for royalty. Everyday utility items owned by commoners would not have lasted as long, as they were constructed out of inferior types of wood.

When trying to identify the density (*Table 3*) of the wood it is important to remember that hardwood structure is, in general, more complex and more readily identifiable when compared to softwoods. This is because softwoods have a limited number of cell types. Furthermore, the density is not only expressed by its weight in kilograms per cubic metre, but also by the strength and durability of the wood (Corbett 2007: 12). For this reason it might have been easier in ancient times to transport the timber after it had been dried, as higher moisture content increases the weight of the timber.

In addition to the physical characteristics, we also encounter aesthetic attributes. Contained within the heartwood we encounter extractives or chemical components that endow certain attributes to the different kinds of wood. These chemicals are responsible for characteristics aromas, colouration (*Plate 6*)[10], and more specifically: decay resistance and durability (Bond & Hammer 2001: 4).

Now that we have familiarised ourselves with the basic characteristics of wood, and the various means of identification, let us look at the different tree species in more detail.

2.4 THE DIFFERENT TREE SPECIES AND THEIR WOOD

Trees and rocks will teach what thou canst not hear from a master.

Bernard of Clairvaux
French abbot, 1090-1153

[10] For an example of some of the wood colours available to the ancient carpenter, refer to *Plate 6*.

Contrary to popular belief, wood was by no means as scarce in ancient Egypt as it is today[11]. Local Egyptian resources were widely used, in spite of their lesser quality, and included acacia, sycamore, tamarisk, poplar, willow, plane, elm and beech. Yet, despite their predominant application in smaller projects, the desired wood for large scale furniture production and construction, both in terms of quality and quantity, had to be imported from elsewhere (Blakemore 2006: 1, Hepper 2009: 17).

Archaeological evidence, mostly in the form of burned timber, from sites such as Jericho, Cayuno, Askili Huyukl, and Hallan Cemi, suggests that the most frequently utilized tree species from early times in the Ancient Near East included cedar, fir, cypress, oak, yew, spruce, pine, chestnut, box, walnut, and ash (Hepper 2009: 45-49, Leospo 1987: 120-123). Less frequently used species included carob[12], maple, beech, cherry[13], and yew[14] (Leospo 1987: 124). These species came to represent the bulk of imported timbers that would have reached ancient Egypt via international trade routes from the earliest of times[15] (Kuniholm 1997: 347).

This combined use of both local and imported raw materials is attested by the presence of numerous wood species from museum and institutional collections (Kuniholm 1997: 347). Given that the identification of wood species is important for us from construction, preservation and trade relation perspectives, it is crucial that we familiarize ourselves with the basic properties and characteristics of this raw material before we examine the finer details of production.

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[11] The drastic reduction in wild groves not only resulted from overutilization as building material and fuel, but was also ebbed along by deforestation, with the aim of creating more agricultural land along the Nile (Leospo 1987: 120).

[12] Carob grew in abundance in Syria, and although raw timber itself may have been imported, the majority of textual evidence seems to suggest that ready-made items of carob were preferred. The list of achievements from Sabni (6th Dynasty reign of Pepi II), along with the annals of Thutmose III, deliberate on the import of boxes, chairs, tables, etc, made from carob wood (Leospo 1987: 123).

[13] The wood of the cherry tree was more commonly used for tool handles, while the bark was used for inlays and other decorative objects (Leospo 1987: 124).

[14] Yew (*Taxus bacata*), a non-resinous conifer, originates from the Taurus mountains (Leospo 1987: 124).

[15] Textual evidence, in the form of the Palermo Stone (2613 BC), reveals that 60 ships were commissioned by Sneferu to travel to Syria to collect cedar (Blakemore 2006: 1). More detail on trade will be revealed in chapter 3.

2.4.1 Acacia (Table 4)

The acacia is identified as a flat-topped tree with fine leaves, thin spiky thorns and yellow /white flowers. It is generally favoured as a beautiful hardwood that darkens with age. The heartwood is of a reddish colour (*Plate 6*) and boasts a high durability, which can be attributed of its fine, close grain. The most common species include *Acacia arabica, A. nilotica, A. senegal, A. tortilis, A. albidal* and *A. seyal* (Hepper 2009: 22, Leospo 1987: 120).

The Acacia is one of the trees most commonly used for production of furniture in the Ancient Near East, as it is a hardy tree with sub-species adapted for survival in varying climatic conditions. The Acacia is encountered throughout the hot deserts of Arabia, Iraq and Jordan in the Middle East, to that of Egypt, spreading towards the tropical forests of central Africa, and the savannas of Sub-Saharan Africa. Despite its availability throughout most of the Ancient Near East, Egypt's main source of Acacia was Nubia (Blakemore 2006: 2, Gale et al 2000: 335).

For this reason the main advantage of acacia is that it is more commonly available than other hardwood species. In addition, it also boasts two advantageous characteristics with regards to preservation. First, insects find the wood distasteful, giving it natural protection against wood parasites such as termites and wood-borer species (Spirydowicz et al 2001: 44). Second, the wood has a high density that prevents water and decaying agents from penetrating and thus destroying the molecular structure of the wood (Filley et al 2001: 13349, Roberts 2006: 5). In spite of its favourable attributes, acacia is limited by the small size of its timber, as the bulk of the tree consists of thinner branches that form part of the tree's canopy. Nonetheless, acacia wood was commonly used for a variety of items including everyday furniture, coffins, bows and arrows, as well as specialised components such as dowels, rods and inserts. With regard to the production of other items, such as boats, we have the following textual references:

Acacia: two boats for the transportation of cattle, warships and kara boats.

Breasted 1907: 229

His majesty sent me to dig five canals and to make three cargo boats of acacia wood of wuWat.

Breasted 1907: 324

2.4.2 Field maple (Table 5)

The field maple is a smaller tree, when compared to the acacia, and is often shrub-like with a maximum height of fifteen metres. The wood is of a pale or yellowish-brown colour, boasting a hard and even grain (*Plate 6*).

It occurs predominantly throughout Europe, the Balkans and Turkey, as well as the coast of the Caspian Sea. The field maple does not occur naturally in Egypt, but there are several sub-species throughout the Ancient Near East yielding useable timber. One of these is the sycamore tree, which provided the timber most commonly used to construct boxes, various items of furniture, musical instruments, knife handles, as well as bows and arrows (Gale et al 2000: 336). The wood of the sycamore is of a light to dark brown colour and often boasts a reddish cast.

2.4.3 Common box (Table 6)

The common box has a shrub-like appearance and can grow up to ten metres tall. Although the tree is not native to Egypt, carpenters experienced the wood of the common box as pleasant wood to work, and would most probably have imported the timber from western

Syria (Leospo 1987: 123). This is evident, as boxwood[16] was especially popular as inlays from the Middle Kingdom[17] to the Ptolemaic Period (Gale et al 2000: 337).

Most importantly, the wood itself is light brown (*Plate 6*), strong, close-grained and considerably heavy, making it ideal for sculptures, small turned items and tool handles. To add to this, the high density of the wood also makes it more resistant to decay (Filley et al 2001: 13349). In this regard it is believed the ancients were fully aware of this attribute, making boxwood one of the preferred wood types for larger items, such as tables and beds.

The Hebrew word *algum* or *almug*, which appears in 2 Chronicles 2: 8 and 1 Kings 10: 11-12 has been identified as either juniper, sandalwood or box, with the general consensus falling on the latter. Large box trees were known to originate from the mountains of Lebanon, and were highly sought-after in ancient Egypt (Musselman 1999: 27).

2.4.4 Ebony (Table 7)

African Black/Iron wood, most commonly known as ebony[18], is perhaps one of the most recognisable species in ancient Egypt. The species is native to tropical Africa and parts of India but it was directly imported into Egypt from the lands of Kush and Punt (according to ancient texts). The wood has a characteristic chocolate colour, ranging between a deep black and dark, rich brown (*Plate 6*). Upon close inspection, the veined appearance closely resembles that of Rosewood. Given the expense of importing ebony, the wood was mainly used to manufacture chests, chairs, beds, footstools, shrines and musical instruments intended for royalty or the upper social classes. More specifically, ebony from the tomb of

[16] The Amarna letters record boxwood as forming an essential part of tribute from Alasia and Mitanni (Leospo 1987: 123).
[17] This example shows that the identification of wood species is valuable to the establishment of a relative chronology for ancient Egyptian furniture. This is because certain wood species were introduced, or used more frequently, during specific time periods, providing us with datable markers.
[18] The most commonly imported ebony was *Dalbergia melanoxylon* of the *Leguminosae* species, rather than *Diospyros sp.* of the *Ebenaceae* species (Leospo 1987: 124).

Tutankhamun has been identified as *Dalbergia melanoxylon*, which originates from the dry wooded areas south of the Sahara (Hepper 2009: 46).

In general, the wood is heavy and extremely hard, making it difficult to work with, yet providing a bright and worthwhile decorative polish. This hard nature made it ideal in various construction projects, as the wood provided strong support (Gale et al 2000: 338-340). This hard, compacted nature also made it exceptionally resistant to woodworm and other parasites (Leospo 1987: 124), thus adding to its overall longevity.

Ebony held an esteemed position as a symbol of wealth and status, and the Egyptian state went to great lengths to ensure the influx of this timber. It was used from the 1st Dynasty to construct furniture and statues, and became exceedingly popular during the New Kingdom. Furthermore, because ebony was such a precious and expensive type of wood, many items were constructed from cheaper, more readily available types of wood, with ebony simply being incorporated as inlays or as strips of veneer (Leospo 1987: 124).

2.4.5 Common ash (Table 8)

The common ash can reach a height of up to forty-five metres and is generally found throughout Europe, with a wood colour ranging between a light and greyish brown (*Plate 6*). The species *Fraxinus syriaca* grows between the eastern Mediterranean seaboard and Iran, with dense populations of smaller trees in Asia Minor and Lebanon (Gale et al 2000: 341, Hepper 2009: 47). Although few furniture items have been positively identified as being manufactured from this type of wood, it is possible that ash was specifically used in the manufacture of tool handles, bows, arrows, and small furniture items (McNeil 2004: 390). The wood is hard and strong, but also perishable, making it a less desired type of wood for items that were meant to last an ‘eternity’. Yet despite its shortfalls, ash’s high level of flexibility allowed for artificial curving and its application in rounded designs (Leospo 1987: 124).

2.4.6 Walnut (Table 9)

Walnut was one of the more precious woods in ancient Egypt and was most commonly used as veneer (Hawass & Garret 2005: 145). It is an incredibly durable hardwood, and, in ancient times walnut was imported to Egypt, possibly making its way from the Mediterranean coast. Today, huge plantations are encountered in Greece, and the possibility exists that walnut may have been one of the species incorporated into a system of sustainable agriculture (Hughes & Thirgood 1982: 71).

2.4.7 Olive (Table 10)

Although the olive is most commonly known for its fruit, the wood from the olive tree was mainly used during later times to manufacture small items (Killen 2001: 582). Fortunately for carpenters, an important part of Olive tree cultivation is the pruning of branches in order to increase fruit productivity. Olive trees were thus not felled in their entirety, but still provided traders with a major source of wood, as the wood was particularly suited for carving delicate objects (Lev-Yadun et al: 1996: 312).

2.4.8 Tamarisk (Table 11)

This fifteen metre high tree is found along the water courses and desert regions of Egypt, Arabia, Iraq and Iran (Gale et al 2000: 345). The wood ranges between a deep gold and dark brown colour (*Plate 6*). Despite its height, *Tamarix nilotica*, more commonly known as the Nile tamarisk, is a shrub-like local Egyptian tree that would have been an unlikely candidate for the production of timber, as it does not develop a thick enough trunk (Leospo 1987: 120). Another local variant species is *Tamarix aphyllia*, which occurs where few other trees would survive (Hepper 2009: 48).

The species *Tamarix jordanis*, as the name states, originates from Jordan and was mainly used in the manufacture of chariot wheel spokes, dowels and joints. In addition to their density, tamarisk trees are incredibly hardy and can grow in soil with a high salt content. This explains their domination along the shores of the Dead Sea (Musselman 2003: 49).

2.4.9 Turkey oak (Table 12)

The Turkey oak (*Quercus cerris*) is a stout tree with a thick trunk and is mainly found in Europe and Asia Minor (Gale at al 2000: 344). The Valonia oak (*Quercus aegilops*) also appears in Europe and Asia Minor, but has an added natural distribution area within Palestine (Hepper 2009: 48). The timber is strong and durable, yet other types of higher grade wood were often preferred above oak. The wood was commonly used as dowels, inserts, roof shingles, ladder rungs, or as veneer (Gale et al 2000: 344).

Apart from imports of oak timber, ancient authors (including Pliny and Theophrastus) note that oak trees were also encountered in Egypt, growing in and around the city of Thebes. As testimony, archaeological evidence has delivered evidence of tannin-rich bark, characteristic of oak, among the remains of a Predynastic tannery at Gebelein, Upper Egypt (Leospo 1987: 123).

2.4.10 Sycamore fig (Table 13)

The enormous size of the Sycamore fig allows it to develop massive branches well suited for cutting timber. Variant species are found locally in Egypt (along the Nile valley), and elsewhere in Israel, Yemen and Oman, with textual references originating from the 18th Dynasty. The wood itself has a coarse grain and is somewhat spongy, making it unsuitable for use in construction. Along with its unsuitability within the construction trade, Sycamore

fig wood was likewise regarded as inferior within the furniture. Conversely, its fibrous and lightweight nature made it a perfect candidate for the construction of boats. This particular trait also made Sycamore wood suitable as roof timbers, coffins and wagons (Blakemore 2006: 1, Gale et al 2000: 340). Within the furniture industry it was more commonly used to create tenon joints and frames (Leospo 1987: 120).

2.4.11 Sidder (Table 14)

This small thorned tree is found in dry regions ranging from Palestine to North Africa. Although the tree provided pieces of timber of ample size, it was rarely used to construct larger items of furniture, as this hard and durable wood was mainly used to produce dowels, boat parts and plywood coffins (Gale et al 2000: 347).

2.4.12 Persea (Table 15)

The persea tree is an evergreen tree reaching up to twenty metres in height and is commonly found in Ethiopia and Yemen, and may even have been cultivated in ancient Egypt perhaps as part of sustainable agriculture. The dark and attractive colour of the wood made it a favourite in the manufacture of beds, tables and various other items of furniture, while the strong, durable nature allowed the wood to be employed as joints, inserts and various support parts used in construction (Gale et al 2000: 342, Hepper 2009: 15).

2.4.13 Elm (Table 16)

The elm can grow up to twenty metres tall and is native to Europe, the Balkans, Turkey and Iran, which means that the timber had to be imported into Egypt. Elm timber grew in popularity from the 18th century onwards, as the durable wood was regularly employed

within the then lucrative chariot industry. These horse-drawn war machines are often depicted on the walls of tombs and mentioned in Biblical texts (1 Kings 10: 29, 2 Chronicles 1: 14 & 17), with the very nature of chariot design and construction demanding a hard and durable wood such as elm (Gale et al 2000: 346, Hepper 2009: 49). This characteristic feature of hardwood would probably also have assured elm a poplar place among carpenters for the manufacturing of dowels and support structures.

2.4.14 Birch (Table 17)

Birch bark (*Plate 6*) dating from the Neolithic Age has been found in the Fayyum and it is believed that the specimens were brought to Egypt by travellers visiting northern Persia (Scott 1965: 130). Although this hardwood would have made a perfect candidate for the construction of furniture items, few samples have been positively identified as birch (Hepper 2009: 45).

2.4.15 Dom palm (Table 18)

This slender tree can grow up to ten metres tall and is found within the dry savannas of Africa and along the Nile River in Egypt. The wood is hard and compact, differing considerably from that of the date palm (Gale et al 2000: 347), making it the preferred local palm within the furniture industry.

2.4.16 Date palm (Table 19)

This tall and slender tree can range between fifteen to twenty metres in height and is encountered throughout Egypt, yet some believe that it may have originated in

Mesopotamia[19]. The wood is incredibly soft and fibrous, making it an unsuitable candidate for joinery (Gale et al 2000: 348). Because of its nature, the trunks were more commonly split and used for roofing (Scott 1965: 129).

Both the date palm and dom palm have loose, fibrous central trunks, while the circular outer trunk or 'crown' is hard and dense. The fibres of the inner core could be used as coverings (perhaps loosely woven or used as cushion stuffing), and the crown was used for carving projects (Leospo 1987: 120).

2.4.17 Gracian juniper (Table 20)

The juniper is a twenty-five metre tall specimen, with various species[20], including *Juniperus drupacea*, growing in Asia Minor, Syria and Lebanon. Timber from this species is smooth and durable and was generally used in construction and the manufacturing of furniture from the 3rd Dynasty onwards (Leospo 1987: 124). In contrast, the species *Juniperus phoenicea* would not have provided sufficient quantities of workable timber (Gale et al 2000: 351). As an example of the junipers' popularity amongst Egyptian royalty, an obelisk inscription from the time of Thutmose III reads as follows:

> *They brought to me the choicest products consisting of cedar, juniper and of meru wood, all the good sweet woods of God's land.*
>
> Breasted 1907: 321

[19] Despite the uncertainties about the origins of dom and date palm, we know that *Phoenix dactylifera, Hyphaene nodularia* and *Haphaene dankaliensis* flourished in parts of southern Egypt in ancient times (Leospo 1987: 120).

[20] For an extended list of Juniper species visit http://en.wikipedia.org/wiki/Juniper

2.4.18 Pine (Table 21)

The pine is a slender tree of up to thirty metres in height and was mainly restricted to Syro-Palestine (Gale et al 2000: 351-352). The wood is resinous and strong, but was rarely used to great extent in ancient Egypt. Although few locally produced items of Egyptian furniture made from pine exist, this does not refute the possibility that items of Pine furniture may still be identified. In fact, their presence within deposits testifies to the import of ready-made furniture as gifts from Syro-Palestine, especially during the time of Egyptian rule over the region. Aleppo pine was also favoured for the creation of chariots during the 18th Dynasty (Leospo 1987: 123).

Other pine species that have been reported in Egypt include the brutian pine (*B. brutia*) and the stone pine (*P. Pinea*) (Hepper 2009: 26).

2.4.19 Cypress (Table 22)

The cypress tree can reach fifty metres in height and occurs commonly in Jordan, Syria, Lebanon and Turkey (Hepper 2009: 46). The wood is of a reddish colour and delivers a fine polish (Gale et al 2000: 350). To add to its visual appeal, cypress also has a pleasant aroma, as Tiglath Pileser III (746-727 BC) mentions:

> *With long cedar beams, no fragrance is as good as that of the cypress tree, products of Ananus, Lebanon and Ammannama.*
>
> Roberts 2006: 5

The tree is often depicted in ancient wall reliefs, and was already well known during the Predynastic Period (Leospo 1987: 123).

2.4.20 Lebanese cedar (Table 23)

Between thirty and forty metres tall, the Lebanese cedar is perhaps one of the most widely recognisable trees from ancient textual references and wall reliefs from the Ancient Near East. Across several centuries, timber from the cedar was imported to Egypt, originating from either Lebanon or the Atlas mountains (*Refer to chapter 3 for more detail on import regions*). Regardless of the fact that ancient sources mention the different origins of cedar, it is impossible to determine the difference between the two regional variants microscopically. It is generally accepted that examples of cedar found in ancient Egypt represent the species *Cedrus lebani* and *Cedrus libanotica,* both imported from Syria (Gale et al 2000: 349, Hepper 2009: 45), as well as *Cedrus atlantica*, native to the Atlas mountains (Leospo 1987: 123).

One of the most desirable characteristics of cedar, both in ancient and modern times, is that it is incredibly strong and dense, and most importantly, it has an exceptional resistance to microbial decay and attack from insects (Filley et al 2001: 13346, Roberts 2006: 5). Furthermore, upon closer investigation, the wood is of a pinkish colour, straight grained and very durable, with polishing resulting in a smooth and highly appealing finish (Roberts 2006: 5). As with cypress, cedar was also coveted by the ancients for its pleasant smell, with the annals of Tiglath Pileser III stating:

> *With tall cedar beams, whose fragrance is as good as that of the cypress tree, products of Amanus, Lebanon and Ammannama (Anti-Lebanon).*
>
> Roberts 2006: 5

As an example, because the wood is straight, free of knots and relatively pliable considering its great strength, items of cedar usually include monumental doors, ship masts, structural beams, furniture and statuary. Indeed, its popularity amongst the various industries required

traders to import large beams of cedar timber, with some of the longest examples measuring 30 cubits (13.72m), 40 cubits (18.29m) and 42 cubits (19.21m). In fact, beams of cedar are more readily identifiable when compared to the short beams characteristic of local timber (Kuniholm 1997: 348).

2.5 CONCLUSION

As we have seen, there existed interconnectedness between the mythological and the physical. Mythological beliefs, including the manifestation of the divine, the apotrapaic role of wood itself and divinely inspired trade, tied in with more tangible physical truths regarding workability, durability and aesthetic appeal. This dual reverence is one that should be understood if we are to place our study of Egyptian furniture within its ancient context. Although a discussion on the mythological aspects of wood and timber could warrant an entire discussion on its own, it is important that we understand the basic connection between the gods and goddesses, their adopted tree species and forest localities (*more on this in our next chapter*).

From a technical point of view the introduction of new wood species lead to the development of innovative technologies and advanced carpentry skills. For example, the availability of hardwoods would have allowed for the creation of stronger, more durable joints, while certain softwoods would have allowed for the adoption of colourful wooden inlays and rosettes (*more on this in chapter 5*).

From acacia to Lebanese cedar, aspects such as durability, workability and longevity have been addressed, unveiling the varied physical elements the ancient carpenter had to consider. From the fibrous nature of dom palm, to the solid, seemingly everlasting hardness of ebony. From light wood, to dark rich browns, and from hardwood to softwood, it is apparent that the ancient carpenter was spoilt for choice when it came to the selection of his most basic construction material.

Now that we have identified the most commonly available wood species let us move on to discover where they came from and, in so doing, discover the lengths to which the ancient carpenter had to go to obtain basic raw materials.

CHAPTER 3

TRADE AND IMPORT

Image 2: *Trees from the land of Punt.*

3.1 INTRODUCTION

As noted in the previous section, Egypt had an abundance of wood resources available for carving, cabinet making, and the production of certain items of furniture, yet the dry desert environment could simply not support the growth of tall trees needed to produce sufficient timber for larger projects. Furthermore, the trees that were available (including acacia, tamarisk, sycamore fig, willow and palm) were either of a fibrous nature or of inferior quality when compared to international imports. Consequently, Egypt had to import the majority of supplies from elsewhere (Johnson 1927: 199, Lewis 1960: 138). But how exactly can we trace the origins and routes of trade?

> *The evidence for commercial and diplomatic links between the emerging state of Egypt and its various neighbouring cultures and states often survives in the form of exotic raw materials and products, as well as the vessels in which they were carried.*
>
> Shaw 2000: 320

It is crucial for us to know where ancient Egyptian carpenters acquired their wood from and during which periods imports either increased or decreased. This will not only allow us to better appreciate the sheer lengths to which carpenters had to go to obtain raw materials, but will also help us to understand why certain wood species appear more frequently, or disappear completely, during certain time periods.

A combination of archaeological, textual and visual (reliefs and paintings) evidence can be used to identify the geographic location of natural resources, important merchant centres, key transportation networks, and influential role players within international trade. Along with this, an understanding of the role of sustainable agriculture will change our

traditional views on ancient forestry and environmental awareness and will, in addition, shed new light on the influences local plantations could have had on foreign imports.

3.2 THE TRADE AND IMPORT OF RAW MATERIALS

Archaeological and textual evidence has revealed that forests were exploited in the Ancient Near East from the earliest times in order to supply both local and international demands in lumber. Sites including Jericho in Israel, and Cayonu, Askili Hoyük, Nevali Cori and Hallan Cemi in Turkey, have provided archaeologists with ample burned remains from architectural timbers and furniture. To illustrate, we have examples of wood from these remains that include cedar, pine, fir, oak, spruce, cypress, box, chestnut, walnut, maple and ash (Kuniholm 1997: 347). The evidence thus supports the view that the tradition of woodworking and carpentry, as well as the needed support systems of forestry and international trade in the Ancient Near East, extend back several millennia (Leospo 1987: 122).

Urbanisation during the late prehistoric period in both Egypt and Mesopotamia would lead to the establishment of urban centres and the eventual development of trade centres along strategic land, river and coastal routes. Some of the earliest trade most likely occurred at this time between Egypt and Mesopotamia, Lebanon, Syro-Palestine, Canaan and Sinai[21] (Knapp 1988: 51, Leospo 1987: 122), with inter-regional exchange now exposing a greater variety of raw materials available through import. Archaeobotanical remains from the third millennium have provided evidence for the early trade in timber from the mountains of Syria and Turkey, intended for markets along the Euphrates. As further evidence, ceramic vessels from sites in both Palestine and Egypt indicate that trade between the two nations already flourished during the Early Bronze Age (3300-2200 BC). In fact, most historians today agree that trade relations existed well before the unification of Upper and Lower Egypt around

[21] Also refer to the discussion by McNeil (2004: 395) and Ward (1991: 11) on trade in these regions.

3110 BC (Chaney & Basbous 1978: 119, Ward 1991: 11). This theory is supported by the archaeological evidence indicating that by the 1st Dynasty (3100-2890 BC), Egypt had already established encampments and way stations along the major trade route into Palestine (Shaw 2000: 321, Bard 2000: 64). These installations were solely trade emporia and were by no means politically or militarily dominated (Ward 1991: 14). With regards to Lebanon[22], inscriptions reveal that trade with this area was already taking place by 2600 BC (McNeil 2004: 395).

When turning to the archaeological record, charcoal remains of Early Bronze Age forests from Palestine indicate that Kermes oak (*Quercus calliprinos*) and terebrinth (*Pistacia palaestina*) were the two most readily available species of wood earmarked for trade, with conifer species such as Phoenician juniper (*Juniprerus phoenicea*), cilician fir (*Abies cecilia*) cypress (*Cupressus sempervirens L.*) and aleppo pine (*Pinus halepensis*) exploited for the timber, resin and oil trade. Both Brown-berried juniper (*Juniperus oxycedrus*) and pine (*Pinus pinea L.*) are only encountered somewhat later in the archaeological record and it is more likely that they came from Lebanon and not Palestine (Hepper 2009: 20, Lev-Yadun & Gophna 1992: 89). The wild growing cyprus (*Cupressus sempiravens horizontalis*), known to the Sumerians as the *hasurru-tree*, is said to have come from the Eastern Taurus (Rowton 1967: 268). Besides the Eastern Taurus, the Lebanon, Anti-Lebanon, Amanus, Taurus, Anti-Taurus, Pontus, and Zagros mountains would also have provided a large portion of these exports (Kuniholm 1997: 347).

Some of the best timber in ancient times came from Cyprus, Macedon, Thrace, and Italy, with the vast majority of Egyptian imports originating from the coastal regions and mountains of Anatolia and Lebanon (McNeil 2004: 396). In addition to the more well-known mountains mentioned above, other mountains and adjacent forest regions included: Adalur, Engissag, Hermon/Sirara (*refer to the quote below*), Supula, Zilhus, Amanus, Gasar, Kullar,

[22] It is speculated however that trade between Egypt and Palestine seems to have dwindled during the Old Kingdom, as exports from Palestine could simply not keep up with high levels of imports from Nubia, Sinai and Lebanon (Ward 1991: 12).

Sigsig, Arandu, Gubbin, Sapuna, Aura, Habur, Malla'u, Surmenu, Bebat, Hana, Meluhha, Wizuku, Dibar/Tibar, Haasur and Merhu. From these ranges were exported: oak, cedar, pine, fir, cypress, plane, terebinth, boxwood and juniper (Hepper 2009: 44-49, Rowton 1967: 269).

When tracing the origins of coniferous exports such as cedar, it is generally agreed that this highly sought after species was exported from Lebanon via the Mediterranean shipping routes from the Early Dynastic Period onwards (Kuniholm 1997: 347, Hawass & Garret 2005: 61) in order to meet Egypt's demand for high quality timber. Even larger quantities of timber, including cedar, pine, juniper and fir, would later be exported from Phoenicia and other lands to the north, from around 2650 BC (Hughes 1992: 19). As evidence of such imports we have the 3rd Dynasty wooden coffin from Djoser's pyramid at Saqqara, consisting of multiple layers of juniper, cypress, cedar and pine (Ward 1991: 13). Further evidence takes the form of a 4th Dynasty document, known as the Palermo stone, which states that Pharaoh Snefru/Snofru (2700 BC) imported enough Syrian timber (including Lebanese cedar) to fill forty ships (Scott 1965: 129, Bull 1938: 39, Kuniholm 1997: 347). From the remains of chariots, wagons, bows, arrows and numerous other items, we know that elm, ash and sycamore were also imported (McNeil 2004: 390).

Quantities of silver required for furniture inlays had to be imported from the Near East, as Egypt did not possess its own natural resources of this valued metal. Although silver was imported from Anatolia from early times (Shaw 2000: 320), it was only during the New Kingdom that we encounter a higher demand for this metal from Egypt (James 1979: 34). The application of silver in any design prior to this period thus represents royal stature in equal measures to that of gold (James 1984: 185). Also, the sporadic quarrying for gold in Nubia that characterised the Old Kingdom would be replaced by a more well-organised and militaristic endeavour during the New Kingdom (Callender 2000: 159), thus allowing gold to become more readily available for designs than silver.

Not only gold but also precious stones flowed from the quarries in Egypt's eastern desert under the command of Queen Hatshepsut (Bryan 2000: 239). The very extent to which precious metals and stones were employed in the furniture industry during this period stands as eternal witness to the successes of such campaigns.

During earlier times turquoise was obtained from the mines of Wadi Maghara, Sinai (Malek 2000: 105, Ward 1991: 12) mainly because this semi-precious stone was not regarded as a viable trade item by Iranian trade cities such as Shahri Sokhta (Postgate 1999: 208). Lapis lazuli and carnelian, on the other hand, two highly sought after items for furniture inlays, made their way from centres in Afghanistan via Elam to Sumer and Akkad (Postgate 1999: 208). Lapis lazuli was in use in Egypt from around 3500-3200 BC, and the principle source of this valued stone appears to have been the four ancient quarries of Badakhshan in Afghanistan (Shaw 2000: 320). In addition, we have textual evidence from the 22nd century BC indicating that a Sumerian king by the name of Gudea sent a trade expedition to the Iranian cities of Magan or Makkan in search of *mesu* or *sisso* wood (a Himalayan hardwood species native to southern Iran) (Mallowan 1965: 4). In addition, the city of Meluhha along the Persian Gulf also supplied *mesu/sisso* wood, ivory and copper[23] (Mallowan 1965: 5). In short, if lapis lazuli and carnelian were imported from as far afield as Afghanistan, it is possible that the Egyptian importers would have seized the opportunity to import timber, copper and ivory from the region.

From Afghanistan and Iran, to Elam, Sumer and Akkad, these items could have made their way along commercial networks of river trade or overland caravan routes to inland cities such as Ebla and Mari, towards port cities such as Ugarit, Byblos and Aleppo, and from there made their final journey along the Mediterranean coast to Egypt's delta region. More specifically, the port city of Byblos most probably stood at the heart of exports to Egypt, as it continually did from the time of Egypt's unification (3100 BC) until the New

[23] Although copper was mined in ancient Egypt, the country's demands for this metal far exceeded its own capacities for production. Egypt thus had to import copper from the 1st Dynasty onwards (Lucas 1927: 162).

Kingdom (Bull 1938: 39, Leospo 1987: 122, Shaw 2000: 327). Even though some may argue that maritime contact with Byblos only began around the 3rd Dynasty (2960-2610 BC) (Ward 1991: 13, Ben-Tor 1991: 3-10), this still leaves us with centuries worth of contact between the two, and numerous possibilities to discuss.

It was from Byblos, for example, that Phoenician boats transported numerous beams of high quality timber to be exchanged for various Egyptian goods such as furniture, utensils and jewellery (Bull 1938: 39). Yet even before Phoenician involvement, Egypt was quite capable of handling her own maritime transport, as the Pharaohs possessed suitable vessels before 3500 BC (Bull 1938: 40). This meant that merchants could undertake their journey via a direct route to Syria, instead of travelling through Palestine. Yet, overland routes into Palestine could also have been utilised as an alternative to sea-faring from the Early Bronze Age onwards. This is demonstrated by ceramic evidence from settlements in Sinai (Bard 2000: 66). Yet it seems as though sea-faring was still the preferred method, as long distance over-land expeditions between Egypt and Palestine only became frequent after the 6th Dynasty (2345-2183 BC) (Malek 2000: 105).

Image 3: A *Phoenician trade ship.*

From about the same time Egypt established contact with Palestine (Early Bronze Age) she also planned on extending her reach beyond her southern borders. Nubia was seen as a land of viable commercial opportunities and supplied Egypt with valuable natural resources via trade routes along the Nile from around 3500-2800 BC (Shaw 2000: 321). Of these, some luxurious goods included gold, copper and ivory, commodities much desired as decorative elements for the furniture of Egypt's financially well endowed. Prepared skins of wild animals were also imported, supplying artisans with the leather needed to prepare thongs and lashings for everyday items of furniture. Along with this, Nubia also supplied ancient Egypt with the much acclaimed and highly sought after ebony wood, known for its durability, rich colour and smooth, polished finish. By the 5th Dynasty (2494-2345 BC) Egypt's reach extended even further south into the East African land known as Punt, which supplied it with added quantities of ebony, ivory, and in addition, a variety of aromatic resins[24] (Shaw 2000: 322). Along with the more well-known species, other fragrant trees were also being imported[25] from Upper and Lower Nubia, during the Middle Kingdom, and from Punt during the New Kingdom (Leospo 1987: 124).

Due to these timber imports, Egypt could now make use of stronger and more durable species of wood, with timber available in long beams more suitable for larger items of furniture. The physical size of such timber beams may even have spurred the development of grandiose items of furniture and the general trend towards creating larger, bolder pieces during the Old Kingdom. All in all, Early Bronze Age imports were merely the beginning of what later became a fully fledged network of trades and imports, with the occupation of Syria during the time of Thutmose III perhaps representing the most lucrative era of international exchange.

Regarding exports from Egypt, it is believed that complete furniture was already exchanged for imported timber during the Old Kingdom (Leospo 1987: 127). Furniture

[24] The import of resin is insightful, as these substances may have been applied in the practice of furniture preservation.

[25] The trading expeditions of Harkhuf (6th Dynasty) and Hatshepsut (18th Dynasty) are well attested (Leospo 1987: 124).

items, closely resembling those encountered in the 4th Dynasty tomb of Queen Hetepheres, have been recovered from Dorak on the sea of Marmora in Turkey. A cartouche embossed on a gilded throne mentions the name of Pharaoh Sahure, providing a 5th Dynasty date for the item. The high value of the chair suggests that it was a gift presented to one of the regional rulers, perhaps in exchange for raw materials (Leospo 1987: 137).

After the decline of the Old Kingdom and the period of internal strife experienced during the First Intermediate Period, the Middle Kingdom of Egypt saw the reunification of the two lands, accompanied by renewed interests in pursuing foreign trade opportunities. In Nubia, Egypt maintained a strong presence: one part military force, one part trade embargo, as expressed by the huge granaries and trade goods storage rooms attached to military outposts. In Palestine no permanent Egyptian force can be verified during this time, although a few military campaigns were attempted (Shaw 2000: 324-325). Rather, it is suspected that Egypt maintained mutually beneficial trade relations with the Levant during the Middle Kingdom, until the Pharaohs of the New Kingdom saw fit to impose a more permanent Egyptian presence. It was thus fairly common to find trading caravans and ships filled with cedar and ivory travelling between Egypt and Syria (Callender 2000: 161).

Gold, tin, copper, silver, and lead were the prominent metals used from the earliest times, with iron only introduced some time during the 3rd millennium[26]. The Middle Kingdom saw an increase in the import of tin from the Near East, as it was required to produce the copper alloy known as bronze (which was introduced sometime between 3000-2000 BC). On the one hand, copper was mined locally by the Egyptians in the eastern desert and Sinai (Bard 2000: 69), yet only from the 12th Dynasty onwards (Ward 1991: 16), while on the other hand it arrived as an import during earlier times from Nubia (Shaw 2000: 320) and Cyprus

[26] An analysis of the various metals and alloys is valuable for the establishment of a relative chronology for ancient Egyptian furniture. This is because certain metals were introduced, or used more frequently, during specific time periods, providing us with datable markers. For example: the availability of certain metals lead to technological developments within the furniture industry, as carpentry tools could now be manufactured from stronger materials (Refer to the section on tool development, chapter 3). Stronger tools also allowed for the creation of more complex joinery methods, linking manufacturing methods and techniques directly to the availability of metals for tool production. Thus said, raw materials, tools and manufacturing methods can all be used as chronological markers.

(James 1979: 34). Bronze was ideally suited for the furniture industry as the alloy proved to be hard and resilient, while at the same time remaining as malleable as pure copper (Knapp 1988: 62). This meant that plaques intended for armrests, backrests and side-panels could be cast in bronze at a lower melting point (James 1979: 221), thereby easing workloads without compromising durability or finer details. Needless to say, the introduction of this alloy also affected the furniture industry on a more technological level, as carpentry tools could now be manufactured from a far more durable metal.

The Middle Kingdom also saw the increase of timber, copper, turquoise and amethyst imports form Kush (Upper Nubia), mainly because access to the region grew after Lower Nubia became a province of Egypt (Callender 2000: 161, Redford 1984: 24). Amenemhat III also ensured that continued turquoise mining in the Sinai region supplied artisans from various industries, including the furniture industry, with ample amounts of this semi-precious stone (Callender 2000: 198).

During the New Kingdom trade imports and exports were at an all-time high. The shift of economic initiatives from Assyria and Babylonia towards Syro-Palestine around 1500 BC, brought with it flourishing coastal ports and well maintained inland emporia, linking the Levant to Cyprus, Egypt, Anatolia and Mesopotamia. The Mediterranean was abuzz with Egyptian and Phoenician merchant ships off the coast, trading with port cities such as Akko, Byblos and Ugarit in Syro-Palestine, as well as ports in Cyprus and those along the Aegean (Knapp 1988: 172). Other commercial centres included Damascus, Qatna, Tyre, Sidon, Hamath, Ebla and Alalakh (Knapp 1988: 50). Thus stated, it is no wonder that the Ancient Near East is seen as a region of complex trade interactions between different economic, cultural and political systems (Kuhrt 1995: 4).

Direct evidence for the nautical trade between Egypt and the Mediterranean coast during the 18th Dynasty (14th century BC) comes from the underwater archaeological remains of a shipwreck near Ulu Burun, Turkey (Haldane 1993: 348, Warnock & Pendleton 1991: 107-108). Goods onboard the ship included copper, ivory, gold, silver, bronze tools,

tin, tortoise shell, cobalt-blue glass, aromatic resin, terebinth resin, as well as beams of Egyptian ebony (*Dalbergia melanoxylon*). The discovery verifies the description of the Ulu Burun ship mentioned on several occasions in the Amarna letters from the same period (Haldane 1993: 348, 352). Furthermore, chemical analyses of terebinth resin from Amarna have been identified as virtually identical to the terebinth resin found on the Ulu Burun shipwreck (Haldane 1993: 353), while resin from the tomb of Tutankhamun has been identified as cedar resin (Hepper 2009: 20), giving further validation of the existence of maritime trade.

Under the imperial expansion of the New Kingdom (and earlier periods), military expeditions not only served as a means to expand or defend exiting territories, but also served to gather resources, as was the case with timber from Syria and Palestine (Linder 1986: 273). One of the best examples here is of Thutmose III, who camped in Lebanon around 1480 BC in order to obtain cedar (Chaney & Basbous 1978: 119). Such was the demand for wood that Egypt was willing to utilise her military (one that was not cheap to maintain) in order to meet these demands. In times of conflict, trees and felled timber constituted some of the most desired items of war booty (Roberts 2006: 1).

Regarding military involvement in trade one must also keep in mind the indirect effects extensive battles and campaigning would have had on supply and demand. In times of peace, timber supplies would largely be utilised by the construction industry, local crafts (such as furniture) and the generation of revenue through trade. Yet during times of war timber would be in short supply, not only because campaigns interfered with transport and shipping, but because militaries needed large supplies of timber for the construction of war machines, such as battle towers and siege ramps, as well as weapons. To add to this, most nations spent a considerable amount of revenues on military funding (McNeil 2004: 388), leaving little for investment into local trades, such as the furniture industry. The availability of wood resources would also be greatly affected by metal-working industries, and as McNeil (2004: 390) puts it:

> *In Egypt and Mesopotamia, where woodlands were scarce and military requirements sometimes heavy, the demands of smelters producing iron for weaponry might easily have made a discernible difference to the extent of forest cover.*

During the New Kingdom Ugarit was the most prominent port of call for Egyptian merchant ships, with ready-made items of Egyptian furniture and other goods being off-loaded, in turn to be replaced by shipments of copper and fine woods, such as boxwood, intended for the Pharaoh's workshops. Permanently stationed Egyptian and Hittite merchants in Ugarit would have ensured that the demand for timber and other goods was met (Knapp 1988: 188-189). Ugarit would also have supplied Egyptian merchants with goods traded from inland centres such as Mari (situated on the middle Euphrates) and Alalakh (on the northern part of the Orontes River) (Knapp 1988: 147). Along with Ugarit, the neighbouring port cities of Sidon and Tyre also stood as important centres of New Kingdom trade, and would in future come to replace the declining city of Byblos during the Third Intermediate Period (Shaw 2000: 328).

The 20th Dynasty, marked by the invasion of the Sea Peoples, saw the fall of the Hittite empire and the loss of Egyptian provinces in Palestine. At the same time, very little activity occurred at the turquoise and copper mines in Sinai and Timna, and the Pharaohs of Egypt no longer possessed the military prowess needed to launch expeditions to the gold mines of Nubia (van Dijk 2000: 306-307). Faced with diminishing imports from abroad and dwindling local supplies, the furniture industry must have suffered great set-backs. Faced with the unavailability of semi-precious stones and metals such as copper and gold, carpenters would have been forced to create less and less luxurious items. Alternatively, the unsatisfied demand for raw materials led to desperate measures, as tombs were despoiled of their gold and other valuables (van Dijk 2000: 309), simply to be melted or re-set as new items. Not only would many a piece of material culture be lost in the process, but the

splendour of Egyptian furniture during the height of the New Kingdom would never be revived.

3.3 ANCIENT TEXTS AND RELIEFS

3.3.1 The value of ancient textual references

> *...one must not ignore the physical evidence for the transactions of trade: documents, seals (and more especially sealings) and weights all derive from the procedures of commercial exchange and are sometimes our only evidence when the nature of the commodities exchanged has wiped them from the archaeological record.*
>
> Postgate1999: 206

Ancient textual references to wood and timber can provide us with valuable information in tracing the origins of imported lumber, as well as identifying the local tree species. With this in mind we are aware of the fact that, in most cases, actual archaeological evidence of imported timber has remained undiscovered, and textual evidence may stand as our only witness to international trade. On the other hand, ancient texts are rarely explicit in their description of ancient woodland environments, or of the physical characteristics of the timber itself. This is because the texts usually describe the type of wood and quantities of imported lumber (and in most cases the country or region of origin as well), excluding characteristics such as hardness, workability or colour (Leospo 1987: 126). In order to compensate for this lack of finer detail, we should utilise archaeology and complementary technologies (such as those discussed in chapter 6), not simply to supplement textual sources but to gain wholly new insights into the nature of trade items such as timber. To add to this, ancient scale models and illustrations of the furniture industry and its workforce can

add to our visual frame of reference (*Refer to the later discussion on illustrations and models*).

To add to the lack of detail encountered in some texts, we have considerably less textual evidence from the rest of the Ancient Near East when compared with Egypt (in our case specifically when dealing with the timber trade). Almost 90% of cuneiform evidence, standing as evidence for ancient forests, dates from 1250-55 BC (Rowton 1967: 276), thus leaving us with a considerable lack of textual evidence from earlier periods. One must remember in this regard, that the ancient Egyptians would most probably have taken much greater care in recording transactions related to the import of timber, mainly because wood was such a scarce resource. In fact, the very acquisition of such resources was seen as a major accomplishment (Roberts 2006: 2) and would have been something for Pharaoh to brag about, as Rowton (1967: 275) puts it:

> *The very instance with which the kings boast of obtaining timber suggests that it was no mean achievement. In most areas, procuring timber would have been beyond the means of an ordinary merchant.*

3.3.2 Ancient textual references: selected case studies

In Egypt, natural groves and wooded areas were so scarce that only the vizier, or Pharaoh himself, could order the lumbering of trees (Leospo 1987: 121). Furthermore, the demand for timber via international suppliers was so high that shipments of raw materials would only be loaded once payment for the goods had been received. In light of this, records had to be kept of all transactions in order to keep stock of the various goods entering and leaving a country. In our case this is very fortunate, as trade documents are often explicit in their description of quantities, volumes and monetary value. As an illustration, third millennium textual references indicate that the principle tree species from Sumerian sites included

tamarisk, willow and poplar (Postgate 1999: 170). As evidence we have the Ur III memorandum on materials for ship building (including bitumen[27]), but needless to say, these species would also be made available for the furniture industry:

> *178 big date palms; 1400 big pines; 36 big tamarisks; 32 big se-hi trees; 10 tamarisks of 3 cubits each; 276 talents palm-fibre ropes; 34 talents palm leaf ropes; 418 talents of rushes; 207 talents of fish oil; 4260 bundles of reeds, 12,384 bundles of dried reeds; 3170 gur (951,000 l) of purified bitumen.*
>
> Postgate 1999: 218

From the 4th Dynasty of Egypt and the time of Pharaoh Snefru/Snofru, we have the following literary evidence for international trade:

> *Bringing forty ships filled [with] cedar logs. Shipbuilding [of] cedar wood, one... ship, 100 cubits [long] [+45.73m], and of meru wood, two ships, 100 cubits [long]. Making the doors of the royal palace of cedar wood[28].*
>
> Kuniholm 1997: 348

Regarding the popularity of Lebanese cedar among the nobility, we have some literary sources in the form of ancient texts accompanying wall paintings. An example of this comes from the tomb of Rekhmire[29] (*Plate 7*), Vizier of Thutmosis III, dated to between 1391 and 1353 BC, and reads as follows:

---

[27] The presence of bitumen on this ancient shipbuilding goods-list is insightful. Although natural resins may have been extracted from local Egyptian species, it appears as though ancient Egyptian carpenters still imported vast quantities, perhaps for application within the furniture industry. The most lucrative export regions for bitumen fall within the Middle East and include the Zagros mountains, areas surrounding the Dead Sea and parts of the Syrian desert (Connah et al 1999: 83).

[28] The possibility exists that the actual translation of the word should be *ash* and not *cedar*, while *meru* may refer to a lower quality timber (Kuniholm 1997: 348).

[29] The tomb of Rekhmire also provides us with an illustration of imported goods, including ivory, ebony, leopard skins and live trees. Judging by the colour of the gift bearers, one can assume that the tribute was received from the south (Kush).

> *...a noble who guides the hands of his workmen, making furniture of ivory and ebony, aromatic wood and redwood, true cedar from the summit of the mountain slopes of Lebanon.*
>
> Scott 1965: 132

From the same tomb we also have another specific reference to cedar and its possible origins:

> *Making furniture in ivory and ebony, in senedjem-wood and meru-wood, in real cedar from the heights of the terraced hills, by this official who establishes guide-lines and controls the hands of his craftsmen.*
>
> James 1984: 204.

More specifically, the text ties in with what Kuniholm (1997) mentions regarding the translation of *meru*. The inscription clearly differentiates between *meru* and true cedar, confirming that the original translation of *meru* as cedar should be reconsidered.

3.3.3 Wood species and forest localities

> *They beheld the cedar mountain, abode of the gods,*
> *Throne-seat of Irnini.*
> *From the face of the mountain,*
> *The cedars raise aloft their luxuriance.*
> *Good is their shade, full of delight.*
>
> Epic of Gilgamesh
> Musselman 2003: 50

Textual references can help to disclose the exact locality of ancient sources of timber, and although the following references may date from much later centuries, one must keep in

mind that they exist within the context of a tradition spanning millennia. Our first example comes from the 7th century BC records of the Assyrian king Assurbanipal:

> *Great cedars which had grown exceedingly tall on Mt. Lebanon, cypress logs whose odour is pleasant, which Adad*[30] *had made beautiful on Mt. Sirara (Hermon), which the kings of the sea coast my vassals have felled... with these I roofed Ehulhul the abode of gladness.*
>
> Roberts 2006: 5

The next two examples, also given by Roberts (2006), come from the reign of Sennacherib (704-681 BC):

> *A great park, like unto Mount Amanus, wherein were set out all kinds of herbs and fruit trees, trees --- such grow as on the mountains and in Chaldea, I planted by its [the palace's] side.*
>
> *...bring out the mighty cedar logs which had grown large in the days gone by and had become enormously tall as they stood concealed in the mountains of Sirara (Hermon).*

For the palace at Nineveh, 22 princes were said to have sent timber as tribute to Esarhaddon from Syria and Cyprus. The account is insightful as it mentions two specific localities from which timer would be acquired:

> *Great beams and tall trunks, logs or planks of cedar and cypress from Mt. Sirara (Hermon) and Mt. Lebanon... from out of the mountains I had them dragged to Nineveh with toil and pain... Long cedar beams I stretched over it for its roof, door*

[30] Once again we encounter references to the divine, linking tree species with forests, wooded mountains and specific tree species (*Also refer to section on the mythology of wood, chapter 2*). In some cases wooded areas are not identified by their geographical names, but are rather referred to as the abode of a specific god (in other words mentioning only the name of the god and not the name of the mountain or wooded area). In these instances a knowledge of local mythology will aid us in pinpointing the location of timber resource localities.

leavers of cypress, whose scent is sweet, I covered with a sheathing of silver and copper, and hung them in its doors.

Roberts 2006: 2

As noted above, not only can texts disclose the exact locality of ancient sources of timber, they can also identify specific species. Not only complete texts, but also individual words can give clues. Ancient texts ranging from the 1st to 3rd Dynasties have delivered three specific words denoting Asiatic woods and oils/resins. The first is *ᶜŠ*, and may be translated as either cedar, fir or coniferous wood in general. Oil from the *ᶜŠ* tree is also mentioned from the 1st and 2nd Dynasties. The second is *sft*, and is generally considered to be an oil or resin. Lastly we have *mrw*, which is also believed to mean either cedar or coniferous wood (Ward 1991: 14).

Perhaps the most detailed account of Ancient Near Eastern tree species can be found in the travel lists of Assurnasirpal II (858-824 BC). Although these texts might originate from a later time period, and from outside of Egypt, they still provide valuable information for our field of study. One must also consider the international climate of cross-cultural trade and the context within long-standing traditions in the region. Thus said, the text (Roberts 2006: 7) reads as follows:

From lands I travelled and hills I traversed, the trees and seeds I noticed [and collected]: cedar, cypress, box, juniper, almond, date palm, ebony, sisso, olive, tamarind, oak, terebinth, dukdu-nut tree, ash, mehur-fir, Dead Sea fruit, tiatu, Kanis-oak, willow, sadanu, pomegranate, plu, fir, ingirasu, pear, quince, fig, grapevine, angasu-pear, sunlalu, titip, acacia, swamp apple, ricinus, nuhurtu, taxxinu, kanaktu (frankincense).

3.3.4 Trade documents and messengers' accounts

From the time of Wenamon[31] and Rameses XII of the 20th Dynasty, we find that timber is still in high demand, even though trade in general was slowing down. The following two accounts, taken from Breasted (1962: 284), stand testimony to the shipping of timber and the felling of trees:

> *He gave my letter into the hand of his messenger. He loaded in the keel, the head of the bow and the head of the stern, with four other hewn timbers, together seven; and he had them taken to Egypt. His messenger went to Egypt, and returned to me, to Syria in the first month of the second season.*
>
> *The prince rejoiced, and detailed 300 men and 300 oxen, placing overseers over them, to have the trees felled. They spent the second season therewith. In the third month of the second season (seventh month) they dragged them to the shore of the sea. The prince came forth and stood by them.*

Treasury documents from this same dynasty provide us with details of the goods stored at the Medinet Habu temple. Among the goods we find the following[32]:

> *I bring to thee lapis lapis lazuli, malachite, and every costly stone in chests, and electrum… I write for thee myriads of ten-thousands, united in a sum of millions, of silver, gold, copper, lapis lazuli, malachite of Reset (R̓-Š̓-ty), fine gold of Emu (ʿnw), before they august father...*
>
> Breasted 1962: 16-17

Interestingly enough, the inscription also specifies the origins of some the gold found in the treasury. This can be very useful when trying to distinguish between local and imported resources:

---

[31] The 21st Dynasty merchant, Wenamon, was sent to Syria by the overseers of the temple of Amun in Thebes to bring back shipments of cedar wood (Leospo 1987: 122).
[32] Bear in mind that these lines are simply excerpts from a much more extensive inscription.

> *Gold of Kush; gold, 1000 deben; gold of the mountain; gold of the water, 1000 deben; gold of Edfu; gold of Ombos, 1000 deben; gold of Coptos; lapis lazuli of Tefrer.*
>
> Breasted 1962: 16

In Papyrus Harris, also from the 20th Dynasty, we find a list of gifts from the Pharaoh to various gods, including Amon, which included substantial amounts of raw materials, including precious stones, metals, and wood. The papyrus is of great value simply because it lists 11 different species of wood:

> *Cedar (bp̓-ny-ny); cedar (tp̓t); neybu (Ṉ y-bw) wood: 3 logs; cassia wood: 1 log; black copper; lead; tin; fine gold and silver; mastic tree (Š̓-w̓-bw): various logs; meru (mry) wood, with ebony; carob wood: a log of 4 cubits length; mera (mr̓) wood; 4 palms; sycamore wood: statues of the Nile god and goddess; cassia wood; persea: various logs; 90 cedar and acacia boats; wood of the myrrh tree: logs.*
>
> Breasted 1962: 132, 140, 153, 160, 190, 194

3.3.5 Gifts and tribute offered to Pharaoh

Trade and booty represent two of the oldest means of moving luxury goods and commodities from region to region (Oppenheim 1967: 241). Yet, besides the acquisition of goods through peaceful trade relations or forceful military campaigns, we also know of goods entering Egypt as tribute (in most cases gifts to appease a mighty ruler). In such instances, raw materials including wood, metals and precious stones would have made their way to Pharaoh's carpentry workshops, producing lavish items of furniture. As an example from the reign of Thutmose III, following the surrender of Megiddo, we see tribute arriving

from Assyria. The goods are recorded in the annals of the second campaign, and read as follow:

> *The tribute of the chief of Assur (Ys-sw-rʾ): genuine lapis lazuli, a large block, making 20 deben, 9 kidet; genuine lapis lazuli, 2 blocks; total, 3; and pieces, [making] 30 deben; total, 50 deben and 9 kidet: fine lapis lazuli from Babylon (Bb-rʾ); vessels of Assur (Ys-sw-rʾ) of (hrtt) stone in colours, very many.*
>
> Breasted 1962: 191

The second tribute of Assur contained more wood than the first:

> *...wood, nhb wood, 343 pieces; carob wood, 50 pieces; mrw wood, 190 pieces; nby and kʾnk wood, 206 pieces; olive wood...*
>
> Breasted 1962: 192

In the same annal, tribute from Retenu is also mentioned. Numerous items including gold jewellery, lapis lazuli, chariots, slaves and silver dishes are recorded, but more specifically related to our study, we hear of the following:

> *...jars of incense, 1718 jars of honeyed wine, and much two-coloured ᶜgṯ, ivory, carob wood, mrw wood, psgw wood, many bundles of fire wood, all the luxuries of his country to every place of his majesty's circuit...*
>
> Breasted 1962: 191-192

From the annals of the ninth campaign of Thutmose we have some of the rare instances where artificial lapis lazuli is mentioned. This particular collection of tribute came from Babylon:

> *The tribute of the chief of Shinar (Sˆ-n-g-rˆ); real lapis lazuli, 4 deben; artificial lapis lazuli, 24 deben; lapis lazuli of Babylon (B-b-rˆ)...*
>
> Breasted 1962: 204

Furthermore, the annals also mention products from the land of Punt, including:

> *...vessels laden with ivory, ebony, skins of the panther; every good thing of this country...*
>
> Breasted 1962: 204

Annals from the tenth campaign mention tribute items from Cyprus:

> *Tribute of the chief of Isy (Ysy) in [this year]: 108 blocks of pure copper (or) 2040 deben; 5 blocks of lead; 1200 --- of lead; lapis lazuli, 110 deben; ivory, 1 tusk; 2 staves of wood.*
>
> Breasted 1962: 206

From the 12th Dynasty tomb of El-Tod in Upper Egypt we encounter actual artefacts resembling those identified as tribute in the texts above, including gold and silver ingots accompanied by over 150 silver cups and goblets. Although no textual recollection is made regarding the origin of these wares, the style of the cups indicates an Aegean or Syrian origin (James 1984: 186). To be more specific, several of the private Theban tombs from the New Kingdom mention that Asian tribute in general came from the following major sources: Upper and Lower Retenu, Tunip and Kadesh, Naharin, the Hittite lands and western Asia, Minoan Keftiu, islands in the Mediterranean, and the Cilician Menenus. The southern commodities from Punt originated from Wawat and Kush, Itjer and Miw,

Khenthernufer and Iunt-Setyu (Aldred 1970: 105). This information is of immeasurable value, as it can identify the exact points of origin for certain raw materials, thus confirming the existence of certain dedicated trade centres.

Gifts from foreign rulers would have streamed into Egypt during the coronation of a new Pharaoh, especially during the time of the New Kingdom when Egypt was one of the five great nations dominating trade and politics throughout the Ancient Near East. Whereas tribute is a yearly instalment imposed upon the provinces of Egypt, gifts come more freely and represent a gesture of good will and continued prosperity between two nations. With wood resources scarce in ancient Egypt, ready-cut beams of timber would have constituted some of the most desired gifts (Postgate 1999: 171). Naturally, tin, copper, lapis lazuli, resins, silver, etc, would also have been sent, most likely making their way to Pharaoh's carpenters.

3.3.6 The Amarna letters

Archaeological evidence from Amarna, in the form of copper chisels, drill bits and various inlays, has brought to light the existence of artisan's workshops within Akhenaton's royal city. Along with this form of evidence we also have a collection of written documents relating to international exchange, known as the Amarna letters. These letters represent some of the most detailed accounts of trade and diplomacy between Egypt, her vassals in Syria-Palestine, and neighbouring powers in the region (Holmes 1975: 376), including Babylon, Assyria, the Hurrian kingdom of Mitanni, Alashia, Cyprus, and the Hittite kingdom of Asia Minor (Campbell 1960: 4). Not only do the Amarna letters refer to the import of raw materials, but they also record the exchange of completed items as diplomatic gifts between rulers.

A prime example of this comes in the form of a furniture collection presented by Amenhotep III to the Kassite king, Kadashman-Enlin, for use in his royal Babylonian palace.

The collection included beds, chairs and footstools made of ebony and ivory, overlaid with gold (Leospo 1987: 124). This kind of exchange between the Egyptian Pharaohs and the Babylonian Kings continued during the reign of Akhenaton, with a selection of furniture presented to King Burnaburiash II (Leospo 1987: 140).

While Egyptian furniture was being exported in this manner, Ancient Near Eastern furniture also made its way into the land of the Pharaohs. Yet, the import of raw materials still exceeded the import of completed items. As testimony the following texts from the Amarna letters, mentioned by Na'Aman (1981: 175), record the influx of raw materials, either as gifts or as tribute:

3.3.7 Wood

EA 160: 14-19. Aziru of Amurru snet 8 ships loaded with wood.

EA 161: 55-56. The same ruler promised to send another transport of wood.

EA 151: 48. An unknown kind of wood is sent from Tyre to Egypt.

3.3.8 Silver

EA 287: 543. 5000 shekels are sent from Jerusalem.

EA 313:7-11. 1400 shekels are sent from southern Palestine.

EA 309: 21. 100 shekels are sent from southern Palestine.

EA 99. The ruler of Ammiya is ordered to send 20 shekels as part of the dowry of his daughter.

3.3.9 Copper and Bronze

EA 151: 147. 5 talents of copper are sent from Tyre.

EA 69: 25-30. An unspecified amount of copper was taken from Byblos.

EA 77:7-8. Rib-Adda of Byblos is requested to send copper and bronze tools.

3.3.10 The Khorsabad wall relief

Not only textual, but also visual references can provide us with detailed information. The Khorsabad wall relief (*Image 4*), a facade from Sargon II's palace (721-705 BC), presents us with elaborate scenes of the river transportation of timbers. Although the relief depicts trade activities along river routes, parallel circumstances may have existed during maritime endeavours, especially with regard to the loading and fastening of timber. According to the relief's images, beams were tied together onboard the ships using special holding devices, while others were tied together with ropes and towed in the waters behind the ships (Linder 1986: 273). While the floatation method was common for river transport, it is uncertain whether this technique was employed during sea-faring expeditions. Specific textual references to this practice include the following texts from the inscription of Gudea of Lagash (2100 BC) (Linder 1986: 274):

> *...with axes he fashioned them [the trees]... [like] giant snakes, cedar rafts were floating down the water...they cut cedar logs 60 cubits long, together with the timbers of Amanus, the mountain of cedar.*

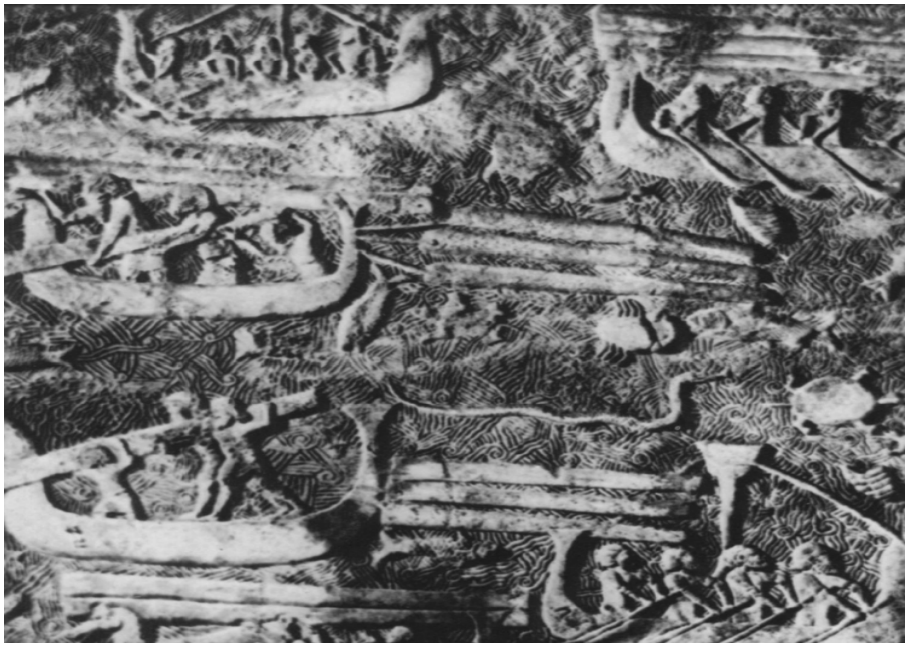


Image 4: A section of the *Khorsabad wall relief.*

3.3.11 Biblical references to wood species

Apart from the textual accounts of ancient rulers and tradesmen, we also encounter over 525 Biblical accounts of tree species of which the following 22 species are recognised (Musselman 2003: 45, Hepper 2009: 22-45):

Acacia	(*Acacia nilotica*)	Lign aloe	(*Aquilaria sp.*)
Date palm	(*Phoenix dactylifera*)	Terebinth	(*Pistacia atlantica*)
Oak	(*Quercus cerris)*		(*Pistacia terebinthus*)
Poplar	(*Populus euphractica*)		(*Pistacia lentiscus*)
	(*Populus alba*)	Fig	(*Ficus carica*)
Willow	(*Salix spp.*)	Thyine	(*Tetraclinus articulata*)
Almond	(*Amygdalus communis*)	Carob	(*Ceratonia liliqua*)
	(*Prunus dulcis*)	Pomegranate	(*Punica granatum*)
Ebony	(*Diospyros ebenum*)	Frankincense	(*Boswellia spp.*)
	(*Buxus sempervirens)*	Plane	(*Platanus orientalis*)
Pine	(*Pinus halepensis*)	Cypress	(*Cupressus sempervirens*)
	(*Pinus pinea*)	Pistachio	(*Pistacia vera*)
Sycamore fig	(*Ficus sycomorus*)	Tamarisk	(*Tamarix aphylla)*
	(*Ficus carica*)	Walnut	(*Juglans regia*)
Apple	(*Malus domestica*)		

Of the above-mentioned species, tamarisk is one of the most well-known species in the Bible (next to cedar). This is mainly because its adaptable nature towards salty earth allowed it to prosper along the shores of the Dead Sea. In the Biblical text of Genesis 21:33, it is mentioned that Abraham planted a grove, most likely consisting of tamarisk trees (Musselman 2003: 49), in honour of God:

> *And Abraham planted a grove in Beer-sheba, and called there on the name of the Lord, the everlasting God.*

The text not only supports the connection between God/the gods and various wood species in the Ancient Near East (and Egypt), but also hints at the notion that sustainable agriculture could have been a possibility during much earlier times than previously suspected. To add support to this idea the Song of Solomon 6:11 mentions the following:

> *I went down into the garden of nuts to see the fruits of the valley, and to see whether the vine flourished and the pomegranates budded.*

It is believed that the text refers to walnut. Since walnut is not native to the Middle East this would suggest that seeds or young plants were especially imported, with pollen remains indicating an introduction date some time during the 2nd millennium BC (Musselman 1999: 33). The walnut tree was kept mainly for its fruit, with trimmed branches utilised for a multitude of applications, including furniture production.

Biblical texts can also indicate the use of less frequently utilised or inferior wood species, as one specific text (1 Kings 6:32) supports the use of olive wood in construction:

> *The two doors also were of olive tree; and he carved upon them carvings of cherubim and palm trees and open flowers, and overlaid them with gold...*

In this instance the specific reference to the covering of olive wood with gold is insightful. Although olive boasts an attractive grain and rich colour, it is not suitable for construction (Musselman 1999: 32) and because of this, is generally overlooked as a source of timber for the furniture industry. Yet, the dead branches of olive trees needed to be trimmed, and furniture manufacturers were grateful for almost any kind of wood, even if the wood was of

an inferior quality. For this, Egyptian carpenters (as many others in the Ancient Near East) had a simple solution; cover the unappealing wood in bronze or gold plating.

The Bible also refers to trade in 1 Kings 10:11, and reads as follows:

> *And the navy also of Hiram, that bought gold from Ophir, brought in from Ophir great plenty of almug trees, and precious stones.*

Hiram refers to the king of Tyre, while *almug* holds a number of possibilities, including box tree, juniper and sandalwood. Regarding ancient Egypt the reference to the box tree could prove insightful, as box wood was a desired medium when it came to the furniture industry (Musselman 1999: 26).

3.4 SUSTAINABLE AGRICULTURE AND ITS ROLE IN TRADE

The very presence of great civilizations, and their participation in various high impact activities (high impact in this sense referring to the environmental impact on forests) activities such as building, metalworking (which required huge amounts of charcoal), slash-and-burn agriculture, furniture production, weaponry and war machine fabrication, ship building, military strategies (such as the burning of opponent's forests) and foreign trade, would forever change the character of forests and wooded areas in Egypt and the rest of the Ancient Near East.

Today, less than 3 percent of ancient forests from Mount Lebanon remain standing (Musselman 2003: 52), while the current state of other mountain regions is similarly dire. Even though forestry was not an exact science in ancient times, we know from later Greek and Roman sources that diminishing forests and depleting resources were recognized threats during the closing centuries of the first millennium BC. Already by 1200 BC Cyprus had lost the majority of its forests, mainly due to the over utilisation of wood for copper

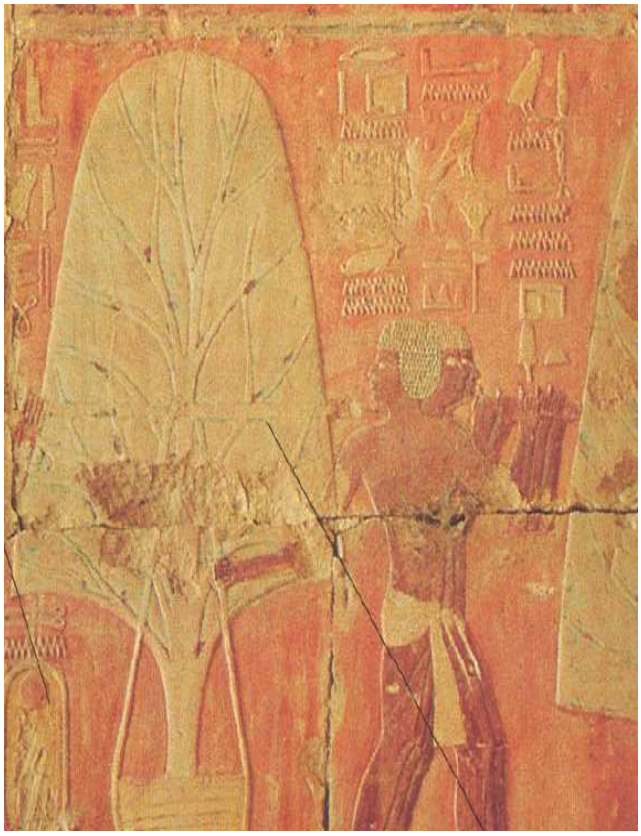
smelting (McNeil 2004: 389), but also partially through the high demand in timber during the 2nd millennium. More forcefully, forests also became 'environmental collateral damage' (McNeil 2004: 401), when the Assyrian kings set fire to the woodlands of their enemies. These varied factors would all inevitably affect the ability of foreign nations to meet Egyptian demands for wood.

On this matter the Classical Period authors such as Plato and Strabo commented on the widespread and severe occurrence of deforestation (Hughes & Thirgood 1982: 62). These ancient philosophers and historians have reflected upon the greater consequences of deforestation (Hughes & Thirgood 1982: 60), in more positive cases giving rise to an awareness of changing climatic conditions, and even the development of sustainable resource management by ancient cultures.

Closely connected to this we have the reigning conditions prevalent in ancient Egypt. Although Egypt was never really well endowed with forests and groves, compared to contemporary cultures along the Mediterranean coast and Fertile Crescent, they perhaps possessed a greater awareness of the value of sustainable forestry, becoming aware of the possibility of agricultural solutions to their problems.

Due to the fact that most tree species suited for the production of sufficient timber were not naturally occurring in ancient Egypt, they had to be planted by hand. Pharaoh rewarded his followers for planting trees along agricultural fields or roads and certain species, such as sycamore, were exempted from taxation (Hughes 1992: 19). Frequently planted trees included acacia, tamarisk, sycamore fig and willow, and reference was often made to these groves and gardens in the texts of ancient noblemen (Scott 1965: 129). Relief carvings and paintings from Hatshepsut's temple in Deir el-Bahri, for example, depict the import and planting[33] of ebony trees originating from the land of Punt (Leospo 1987: 124).

[33] Author's note: whether or not these illustrations prove the existence of sustainable agriculture remains debatable. What we can say with certainty is that the Egyptians were capable of importing live trees from neighbouring countries, and surely possessed the capacity to import larger numbers if required.



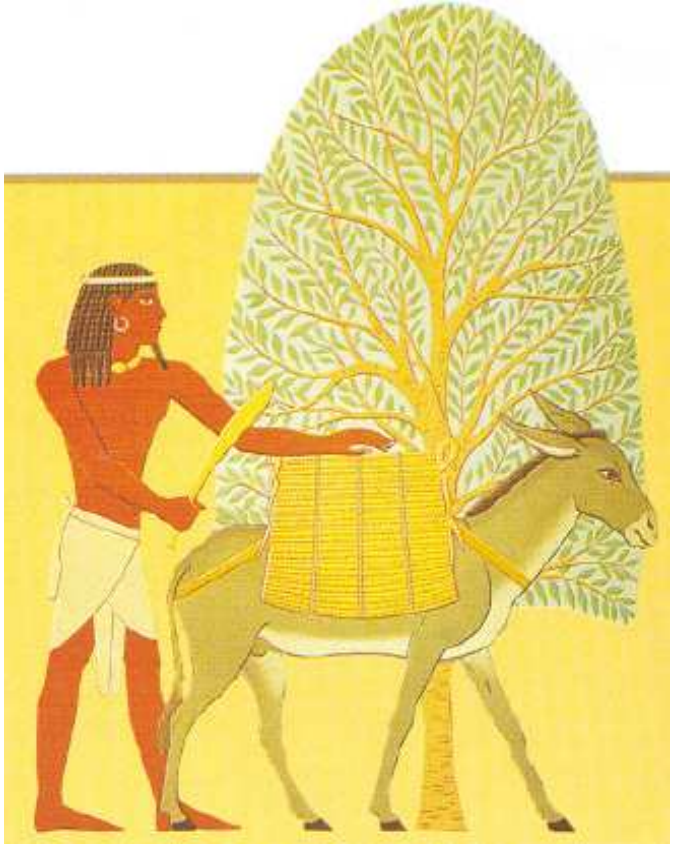


Image 5: *Images from Hatshepsut's expedition to Punt, depicting myrrh (left) and ebony trees (right).*

In addition to the ancient awareness of environmental constraints on natural resources, sustainable agriculture was also fuelled by an economic need to fulfil local demands for cheaper, locally accessible raw materials used in furniture production. Indeed, many household items from the lower ranks of society were most probably indebted to local sustainable agriculture, without which the furniture industry would have failed to develop as a viable economic role player.

Not only Egypt, but also her Near Eastern neighbours started to realise the value of sustainable agriculture. Although the majority of textual resources mention gardens[34] (*Plate 8-9*) and orchards being planted for the sake of beauty, shade and fruit, it can be proposed that the ancients would have noticed the potential of planting artificial forests. From the annals of Tiglath Pileser III (746-727 BC) we read the following:

[34] *Plate 8:* A garden scene from the tomb of Nabamum, 18th Dynasty, depicts several species of both local and imported trees.
Plate 9: Trees and other plants from a garden grove, 18th Dynasty tomb of Sennedjem.

> *I took cedar, box-tree, Kanish oak from the lands over which I had gained dominion – such trees which none among previous kings, my forefathers, had ever planted – and I planted them in the orchards of my land. I took rare orchard fruit which was not found in my land and herewith filled the orchards of Assyria.*
>
> Roberts 2006: 4

Yet despite all earlier efforts, it was only during the Ptolemaic Period that conifers were successfully grown in Egypt's Fayyum region. This initiative had to be so well managed that a special organisation, known as the 'house of pine', had to be established (Leospo 1987: 122).

3.5 CONCLUSION

Through a review of archaeological evidence, ancient textual references and visual media (reliefs and paintings) it was revealed that the rule of supply and demand was as valid in ancient times as it is today. Because of the desire for utilitarian and royal furniture, the demand for timber (and other raw materials) had to be met by a reliable supply of international imports from the earliest of times.

Evidence of burned furniture, from cities like Jericho, Askili Hoyük and Cayonu, suggests that carpentry traditions were well established during the Early Bronze Age, with the needed natural resources already territorially managed several millennia ago.

With early trade links existing between Egypt, Mesopotamia, Lebanon, Syro-Palestine, Canaan and Sinai, ancient Egyptian carpenters accessed a multitude of desired resources via international trade. Trade cities such as Ebla, Mari, Byblos and Ugarit would have witnessed the sale and transportation of vast quantities of timber across the millennia, with eager traders entering their gates in search of the finest wood.

From the highest mountains and densely wooded areas, known to some as the abode of the gods, came one of the most highly prised commodities in the ancient world: timber. From wide geographical regions, and specific location such as Hermon, Gasar, Sapuna and Haasur, came the timber desired for both construction and furniture manufacture. Mountains such as the Eastern Taurus, Amanus, Pontus and Zagros would have echoed with the sound of fallen giants, crashing down at the axe falls of ancient loggers.

From trade centres such as Byblos, Mari, Magan and Makkan, departed heavily loaded trade embargoes filled to capacity with raw materials such as timber, copper and turquoise. Mighty trade ships tugged huge logs behind them, like ominous sea monsters, from Mediterranean port cities to Nile shipping yards. Via overland caravan routes came precious metals, semi-precious stones, ivory and animal skins, all intended to adorn the wooden superstructures intended for royal use. From tradesman to gardeners, the ancient Egyptian state made sure that foreign tree species were imported, creating some of the earliest commercial plantations in history.

The availability of these resources not only stands as testimony to the endurance of tradesmen, or the organisational prowess of dynastic Egypt, but also represents the desire of both royal and affluent Egyptians to possess luxurious goods made of imported timber. It seems that no matter the cost, or the lengths to which trade connections and political authority had to be exploited, the demand for imported timber had to be filled.

CHAPTER 4

TIMBER PREPARATION AND TOOLS

Image 6: *Bronze and wood model tools from the 18th Dynasty*

4.1 INTRODUCTION

Timber preparation is perhaps one of the most crucial steps in ensuring the longevity of furniture items. Without the correct moisture levels, proper stacking and correct seasoning, ancient Egyptian furniture would have no hope in enduring eternity without warping, cracking or splitting. If we are to understand the production process as a whole, we have to start at the very beginning by investigating felling practices, log trimming and beam cutting. These are all technical aspects of the manufacturing process that are in turn affected by the very tools wielded by the carpenter.

While some may argue that carpentry is like music, and that a good musician will deliver a brilliant performance based on skill alone, and not the quality of the instrument, others argue that the instrument with which one performs is part and parcel of the end result. In the case of the ancient carpenter the latter is more accurate. This is because the tools themselves directly influence elements such as workability and product finish. In short we can say that although the tool does not ‘make the man’, it can become an extension of his body, his soul and his creativity.

Indeed, the workability and product finish is directly related to the quality of the tool, the material from which it is produced, as well as structural advantages or defects. As an illustration one simply has to examine the effect saw tooth orientation has on the texture of wood, or how different types of sandpaper produce varying finishes. It is therefore of utmost importance to our study of ancient furniture that we once again consider the most prominent elements influencing production.

4.2 TIMBER PREPARATION

4.2.1 Felling trees

> *From the moment a tree is selected for felling, it is subjected to a continual process of evaluation to grade its quality and most useful content.*
>
> Corbett 2007:14

In this regard the same can be said of the timber industry in ancient Egypt. First, the ancient carpenter had to select a tree species known for its quality and workability, one which would have provided straight trunks with sufficient heartwood and limited defects (Killen 1994a: 12). Second, he needed to consider the various technical aspects, such as felling, drying and cutting; techniques which would inevitably influence the quality of the raw material delivered to the workshop. As we shall discover in this chapter, the methods employed by ancient lumberjacks directly influenced production within the furniture industry.

Image 7: *Workmen felling trees: Scene from the tomb of Thutmosis IV.*

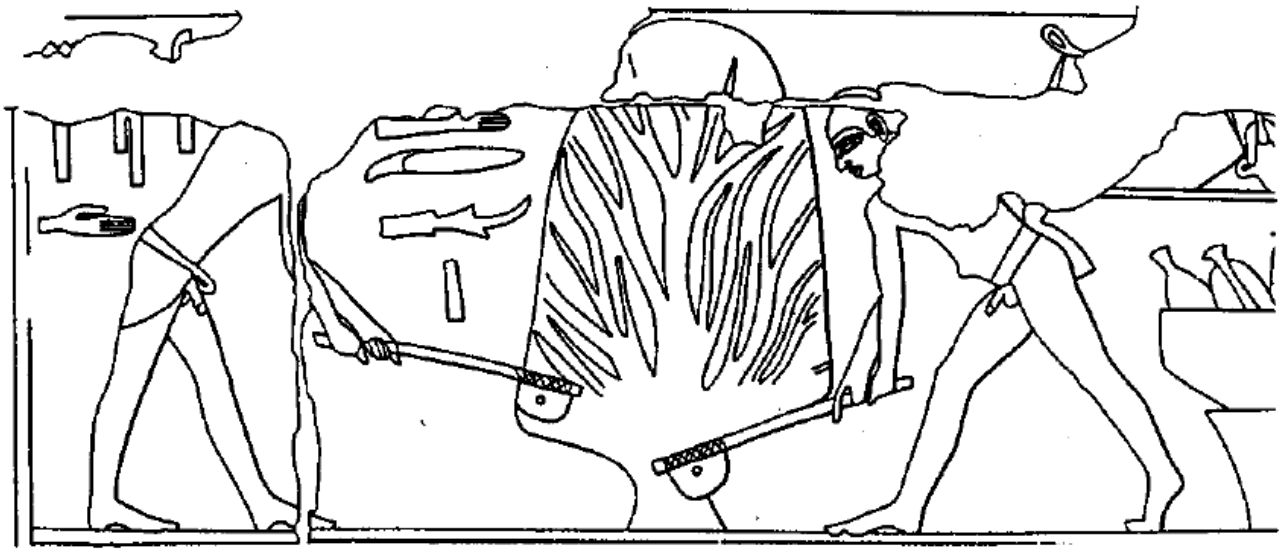


Image 8: *Workmen felling trees with rounded axes. Scene from the tomb Knumhotep Ni'ankh-khnum.*

Limited information is recorded in ancient texts regarding the felling of larger trees in high yield regions of the Ancient Near East, considering the fact that ancient authors were more concerned with conveying information regarding exports, international trade and commercial value, than they were in conveying the technical aspects related to the labour intensive work of ancient lumberjacks. Yet, thanks to the highly visual and descriptive nature of Egyptian art, we have numerous (and quite detailed) examples of the methods employed by Egyptian lumberjacks and carpenters (Rogers 1996: 12). One such example comes from the Beni Hasan tomb of Knumhotep III[35], which depicts carpenters felling indigenous trees using axes (Killen 2002: 646).

From the Old Kingdom onwards, Egyptian carpenters used two basic methods when felling smaller local trees: single-notch and/or double-notch. Irrespective of these individual methods, a standard process of felling would be observed. This process involved a single individual cutting the base of the selected tree, while a group of men suspended the felled tree using ropes attached to the topmost branches, thereby ensuring its gradual decent to

[35] The coffins discovered by John Garstang, at the Middle Kingdom cemetery of Beni Hasan, indicate that large quantities of imported timber were available to the thriving carpentry workshop at this ancient location (Killen 2002: 646). In recent years a coffin from tomb BH 723 has been identified as cedar wood (*Cedrus sp.*) (Davies 1995: 147). Moreover, Khnumhotep III himself, under the rulership of Senusret II, conducted numerous voyages to the Red Sea and Byblos (http://en.wikipedia.org/wiki/Khnumhotep_III), with the possible aim of securing foreign timber for Beni Hasan projects.

earth (Killen 2001: 581). This would ensure that the grain of the wood itself did not become damaged by the tremendous impact experienced upon hitting the earth.

After the trees were felled, the logs had to be trimmed of excess branches. At this stage the workmen also had to clean the log by removing the bark and sapwood (Leospo 1987: 125, Rogers 1996: 17). As is clear from the detailed wall painting from the tomb of Ty (2500 BC), this job was accomplished using a combination of axes and adzes[36].

Image 9: *Carpenters processing a log: Scene from the tomb of Ty.*

4.2.2 The sawing, stacking and drying of timber

After the trees were felled, workmen had to cut the logs into more manageable boards before the wood could be stacked for drying. Longer boards were split or cleaved[37] from the original logs by carpenters wielding mallets and wedges, while additional workmen laboured simultaneously with axes to define and trim the edges. To ensure safety throughout this process, the logs would have been strapped to a trestle: an apparatus that has not changed much over the millennia, providing support by means of a horizontal beam held up by a pair of splayed legs at each end. This arrangement allowed taller logs to be positioned horizontally, thus accommodating their length. In comparison, shorter boards were cut using

[36] http://www.osirisnet.net/mastabas/ty/e_ty_05.htm
[37] According to Rogers (1996) depictions of log splitting in ancient wall reliefs are rare, with the tomb of Ibi (Old Kingdom) providing the only visual reference.

saws, with the log secured to posts in a vertical position (Killen 2001: 517, Leospo 1987: 125).

Regarding the method of cutting itself, the ancient Egyptians would most probably have employed the method of 'through and through' cutting, as quarter sawn and plain sawn methods would have required much more advanced machinery than was available within the range of the ancient tool kit (Killen 1994a:13).

Once the above-mentioned process had been completed, the beams were then positioned on a simple lumber stack, which would allow for natural air drying[38]. This was a crucial step in preparing the wood for any purpose, be it architectural construction or furniture production, as the moisture level of the wood greatly influences both the quality and workability of the raw material, and more importantly, the durability of the finished product. This is because drying not only reduced the possibility of future movement (expansion and shrinkage in the finished product), but also provides less favourable conditions for the growth of microbial agents of decay, such as fungi (Killen 1994a: 14, Leospo 1987: 125).

In this regard the ancient Egyptian carpenters were fortunate in having a desert-like environment, which supplied ample amounts of hot, dry air for circulation between stacked timber boards (Leospo 1987: 125). Yet, although the ancient carpenter rarely expressed concern over high moisture content in timber boards, the rapid drying conditions (combined with the somewhat inferior method of 'through and through' cutting) run the risk of effecting certain structural defects, such as cupping, bowing, springing and twisting (Corbett 2007: 17, Killen 1994a: 13). These defects are mainly the result of shrinkage due to excessive moisture loss. Fortunately, these effects could be prevented, or at least minimized, by employing properly constructed and well-positioned lumber stacks, which would have counterbalanced such distortions. The ancient Egyptian carpenters also kept beams away

[38] Along with the naturally dry climate, sealed tombs provided additional protection by preventing unwanted exposure to outside climatic conditions (Leospo 1987: 120).

from direct sunlight, often covering them with matting to prevent unwanted rapid drying (Killen 1994a: 14).

To expand upon the subject of moisture content, it is known that freshly cut softwood weighing 10kg can contain approximately 5kg of water (Corbett 2007: 17). This ratio is what is generally referred to as 100% moisture content. Because the evaporation resulting from such high moisture content will affect shrinkage and movement, it is essential for the moisture content to be drastically reduced before any attempt is made to employ the timber in construction or production. The resulting moisture content from natural air drying can range between 18 to 20% in more humid environments, to as low as 12% in hot, dry conditions (Corbett 2007: 17). It is thus safe to say that ancient Egyptian timber would have possessed an advantage over other Ancient Near Eastern sources when it came to ideal moisture content. This, in effect, would have provided the Egyptian furniture industry with a natural advantage, especially when it came to the future preservation of wooden items, thus directly contributing to the fame and desirability of Egyptian-made furniture across much of the Ancient Near East.

Although very little is specifically mentioned in ancient texts regarding the seasoning of timber, the condition in which the majority of wooden items have been found suggests that the ancient carpenter was well aware of the detrimental side effects of using unseasoned wood. In fact, James (1984) attributes the tight fitting lids, firm joints and unwarped boards of furniture items to the employment of well seasoned timber.

To expand on this topic, and to give one final overview of moisture content and drying, a few interesting questions linking trade and the preparation of timber can be addressed: “Why did international traders prefer to transport pre-cut timber boards instead of felled logs?”, “Was it not easier and less labour intensive to simply transport felled logs?” and “Did moisture content and drying influence the transport of timbers?”

In considering the information on weight in relation to moisture content discussed above, the answer to the latter question would be a resounding “yes”. It would seem as

though Ancient Near Eastern lumberjacks not only cut logs into beams to ease transportation, but they also enacted such practice to allow for drying prior to export. The considerable amount of weight lost during the drying process would allow for larger volumes of timber to be exported, thus promoting greater profits. The ease of transport and the increase of exports provide a dual explanation for why timber was exported in beams, and not in the form of less labour intensive felled logs.

4.3 THE EVOLUTION OF THE ANCIENT CARPENTER'S TOOL KIT

Before we can elaborate on a discussion of ancient Egyptian production methods, we first have to gain a better understanding of the variety and scope of the carpenter's tool kit.

The ancients possessed the majority of tools we ourselves utilize in modern times. These included measuring and levelling tools such as plumb-bobs, cubit rods, right angles or t-squares, and cutting aids (resembling modern mitre boxes), with general carpenter's tools including axes, saws, wedges, adzes, hammers, chisels, mallets, drills and even sanding blocks (Kuniholm 1997: 349). These tools were mainly manufactured of unalloyed copper, arsenical copper, tin bronze and leaded tin bronze (Arnold 1991: 257).

Thus, when considering the technological aspects of tools, such as quality and durability, one has to pay attention to the raw materials exploited for the production of these implements. Over time, and with the import and increased availability of stronger raw materials, the ancient tool kit underwent an evolutionary process, developing from simple flint knives and saws to stronger, more durable iron prototypes. This technological transformation played a key role in the growth and development of the furniture industry, bringing with it new methods and techniques that would contribute to the fame and quality of Egyptian products.

During the Predynastic Period, flint saws and knives were replaced by simple copper tools between 4500 and 4400 BC, followed by the introduction of the copper drill between

4000 and 3500 BC. This introduction of metal tools brought with it not only a higher degree of accuracy (Leospo 1987: 125), but also led to the development of skills now regulated by the unified state of Upper and Lower Egypt. In support of this growing specialization, Professor Walter B. Emery (who excavated in Saqqara between 1930 and 1950) discovered a large collection of saws and other carpentry tools, dated to the 1st Dynasty (Baker 1996: 19, Killen 1994a: 19).

It is believed that bronze made its way into Egypt (possibly from Syria) for the first time during the Middle Kingdom in the form of ingots, and soon presented carpenters with new technological advantages. As time progressed, and as metal imports from foreign nations increased, simple copper tools were systematically replaced by bronze prototypes, with the mixture of tin and copper providing a malleable, yet considerably stronger metal with which to produce tools. Archaeological evidence indicates that bronze tools were first used around 2000 BC (Killen 1994a: 41, Leospo 1987: 125).

The influx of the Hyksos during the 2nd Intermediate period ensured that the ancient Egyptian carpenter also gained access to iron, a strong metal with a durability that far surpassed that of its bronze precursor. It is thus unsurprising that by the New Kingdom, items of Egyptian furniture were famed for their exceptional quality, not only through the skill and craftsmanship expressed by their creators, but also through the refined finishes now offered by high quality tools.

An understanding of tool quality is of great importance, as tool markings on wooden surfaces can provide insights into the manufacturing process as a whole. Certain markings are associated with specific tools from specific time periods and an analysis of these markings can aid us in establishing a chronology for ancient furniture. Drdacky et al (2004: 33) provide an example from historic architecture, which is equally relevant to our study of ancient Egyptian carpentry:

> *Analysis of tool marks on historic timber structures helps to understand ancient carpentry techniques and facilitates their revival in restoration practices.*

4.4 CARPENTRY TOOLS

4.4.1 Measuring instruments

Before any work could commence the ancient carpenter had to illustrate the plans and designs of the intended item on papyrus. Factors such as available raw materials, aesthetic character and client specifications had to be considered (Leospo 1987: 125-126). It thus seems logical that the carpenter (or at least the workshop coordinator) would have possessed basic drawing and writing skills to compile plans, while his team members should preferably have possessed rudimentary plan reading capabilities in order to follow visual instructions.

Before the timber could be cut into usable beams, careful measurements had to be made in order to ensure satisfactory results. The main instrument for this purpose was the cubit rod (*Plate 10 - 12*), which measured lengths according to Egyptian royal cubits, hands, palms and fingers. Although this system may seem subject to great variation depending on the physical attributes of the individual performing the measurements, a standard system was recorded around 2700 BC and henceforth incorporated into the markings carved on cubit rods.

Because Ancient Egyptian art and furniture had to conform to strict symbolic guidelines relating to size and dimension and it is important for our study of ancient carpentry to be aware of the standard units of measurement, as set out below:

1 finger (*db*) = 18¾ mm
1 palm (*šsp*) = 4 *db* = 75 mm
1 hand (*drt*) = 5 *db* = 93¾ mm
1 fist (*amm*) = 6 *db* = 112½ mm
1 span (*spd*) = 12 *db* = 225 mm
1 foot (*bw*) = 16 *db* = 300 mm
1 remen (*rmn*) = 20 *db* = 375 mm

1 ordinary cubit (*mh*) = 24 *db* = 6 *šsp* = 450 mm

1 royal cubit (*mh*) 28 *db* = 7 *šsp* = 252 mm

1 *nibw* = 32 *db* = 8 *šsp* = 600 mm

1 double remen = 40 *db* = 2 rmn = 750 mm

1 rod (*h3yt*) = 280 *db* = 10 *mh* (royal) = 5.25 m[39]

In order to indicate the measurements on the wood itself, carpenters used a simple carving knife, also known as a scribing instrument, to create scoring lines on the surface of the wood (Killen 1980: 12). Once the measurements were demarcated, the timber had to be levelled in order to ensure a well-balanced, straight-cut. This levelling was accomplished by the use of a plumb bob (*Plate 13 - 15*), which closely resembles those found within the masonry and architectural industries. This triangular instrument includes a line weighted down by a bob and uses gravity to align the plumb line to a centred marking on the frame of the device. The measuring was probably done with the timber already affixed to support frames, with slight adjustments being made to the entire unit in order to achieve a level cutting surface. In addition, try squares (builder's squares) and cutting aids provided guidance, especially where angled sections were required to fit perfectly, or where intricate joints had to be cut. A perfect example of the use of these measuring instruments comes from the tomb of Rekhmire (18th Dynasty), where a square (*Plate 16 - 17*) is depicted lying in a carpenter's workshop (Arnold 1991: 253). It is clear from such frequent depictions in wall reliefs and paintings that the try square was already a widely used measuring aid by the New Kingdom (Killen 1980: 13) and that it was a popular amulet shape for carpenters.

[39] http://en.wikipedia.org/wiki/Ancient_Egyptian_units_of_measurement

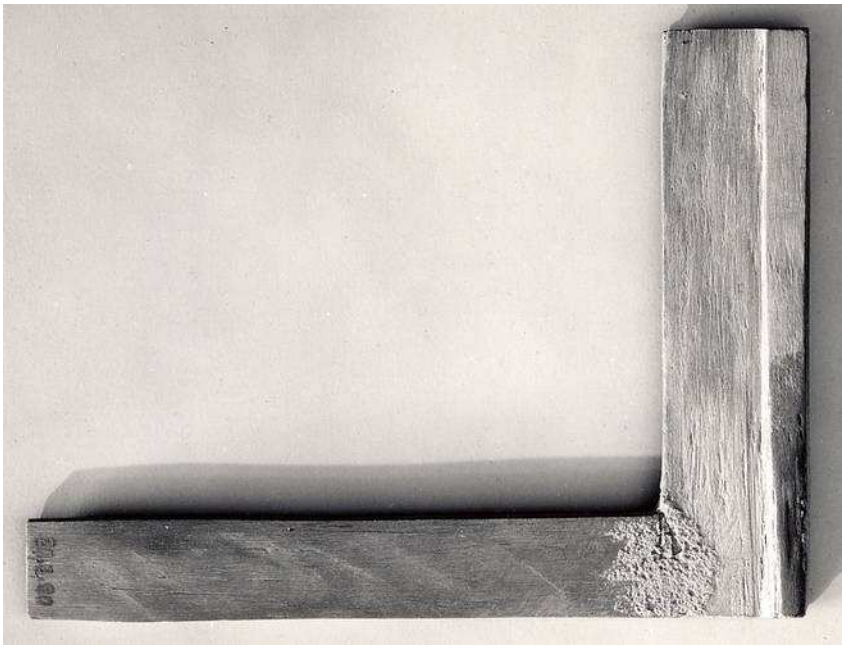


Image 10: *12th Dynasty square from the tomb of Meketre, southern Asasif.*

Image 11: *Carpenter's amulets in shape of squares from the 26th Dynasty.*

4.4.2 Saws

The earliest cutting tools in ancient Egypt took the form of saw knives, some of which have been dated back to around 3000 BC. Concomitant with the development of the furniture industry, the earliest copper saws emerged during the 1st dynasty, with the basic shape closely resembling that of knives from the same period (Killen 1980: 19). These saws[40] were short, boasting curved edges and rounded blunt noses, with teeth on a single side of

[40] We seldom encounter reliefs with clear depictions of saws from the Old Kingdom, with the tomb of Ty presenting us with some of the best examples (Rogers 1996: 19).

the blade (*Plate 18 - 21*). Saws[41] employed to cut intricate designs or complex joints were usually one handed, to allow the carpenter to use his free hand to secure the item of manufacture. In contrast, the saws used to cut beams or larger items often came in two-handed versions, thus allowing the user to put his bodyweight behind the thrusting motion. In the case of the latter, we often find that the swan object or beam was supported by a sturdy frame, wedges, tourniquets and weights[42]. In order for us to fully understand the technicalities of sawing, we have to consider the manufacturing of this tool in itself.

After the edges were beaten to provide added hardness and durability, the teeth were meticulously punched out. The process was by no means perfect and teeth were often flat/blunted or irregular in shape and pitch (James 1984: 201). This unfortunate result of early cutting techniques not only made it difficult for carpenters to manoeuvre their saws, forcing them to use wedges in order to prevent saw blades from jamming in the resinous kerf, it also left undesirable marks on the worked surface[43]. In contrast to the bi-directional orientation of modern saw teeth, ancient teeth were aligned in the same direction and left behind undesired lines[44] (at alternating angles) as the saw worked its way through the wood (Killen 2001: 516-517).

Thankfully, with the introduction of the pull-saw[45] shortly after the 1st dynasty (Killen 1980: 20), ancient carpenters could now overcome some of the technical difficulties experienced during the cutting of large timber logs. This new prototype provided greater ease of movement, increased accuracy and superior workability by pulling the sword instead of pushing it (James 1984: 201). The thin-bladed saw possessed roughly notched, uncanted teeth, and only cut through the wood as the saw was pulled towards the user. To accommodate this pulling motion, the saw handle had a downward turned knob in order to

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[41] Saws were known as *tf* and *wsi* and sawdust was referred to as *wst* (Buccellati 1977: 133, Faulkner 1962: 68, 298).

[42] The combination of the tourniquet and weights secures the timber to the post, while also preventing the cut sections from vibrating excessively during sawing (Rogers 1996: 20).

[43] These problems are attested in the coffin boards of Tarkhan. (Killen 2001: 517*).*

[44] Although this may have been an undesired result for ancient carpenters, modern researchers find this phenomenon quite intriguing, as it allows them to devise a relative chronology for items based upon the unique markings associated with specific tool technologies.

[45] The word *tf* has been translated to saw in (Atiya & El-Shahawy 2005: 84), with others believing it refers more specifically to the pull-saw.

give the carpenter a better grip (Rogers 1996: 19-20). Taking advantage of this new development, carpenters now employed this technology to improve the design errors of the short saw, which continued to be used throughout the ages, especially when it came to cutting joint faces. Some of the best illustrated examples of the pull-saw originate from the tombs of Rekhmire Apy, Menkheperrasonb, Nefer-Hotep, and Ipuky and Nebanum and the temple of Hatshepsut (James 1984: 201, Killen 1980: 20).

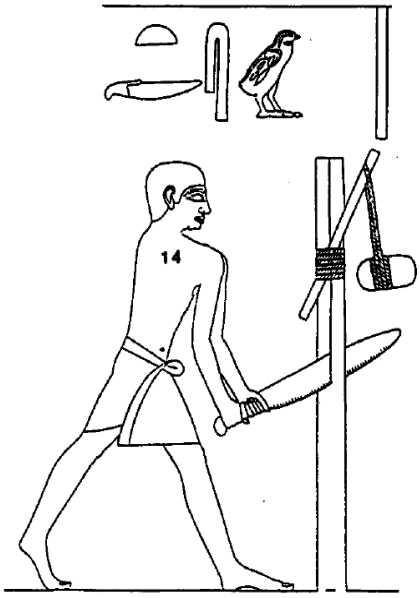

Image 12: *Carpenter sawing an upright beam in half. Notice the counterweight system towards the top of the beams. Tomb of Ty*[46] (Plate 22).

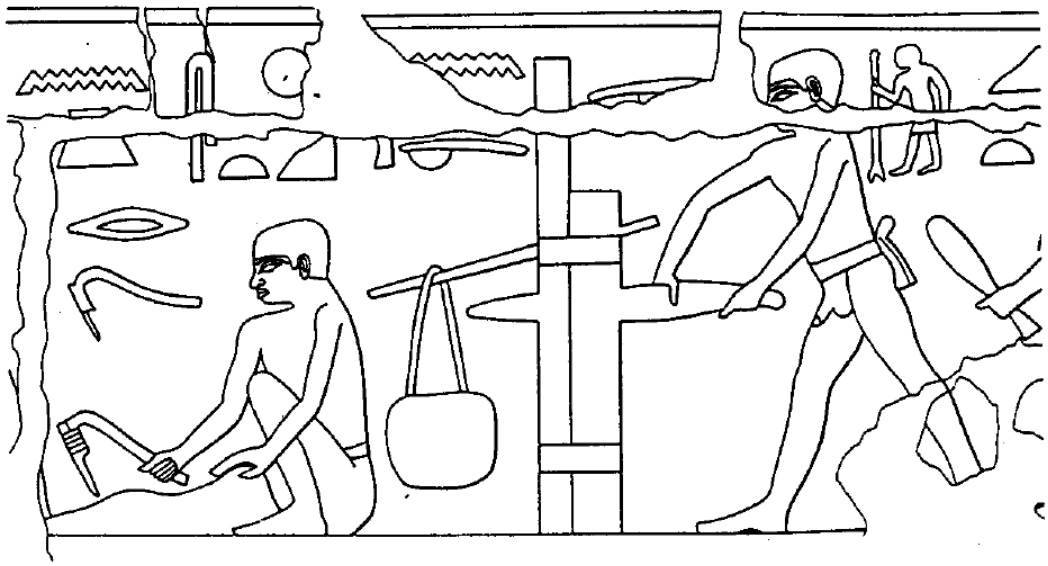

Image 13: *Carpenter sawing an upright beam. A much larger counterweight is used. Tomb of Ni'ankh-khnum and Khnumhotep.*

[46] A tomb model depicts a similar scene as the one illustrated from the tomb of Ty.

Image 14: *Ceremonial saw from the 18th Dynasty.*

4.4.3 Axes

In conjunction with cutting the timber boards down to size using saws, cleaving axes[47] (*minb*) were used to define the edges, allowing the boards to be standardized in size and shape before being stacked for drying. During early dynastic periods axe blades were cast in copper (Killen 1980: 15), with later versions being made of bronze and, much later, iron (*Plates 22 -25*). The general design[48] sees the blade being shaped to form a rounded cutting edge with integral projecting/concave side lugs (Killen 1994b: 12). This specially designed blade would then be hafted to a wooden shaft by wedging it into position and fastening it using wet leather thongs, which would shrink as it dried, thereby fixing the separate compounds to form the tool (Blakemore 2006: 14). Some later axes are even depicted as having holes in the centre of the blade, through which the lashings would be passed (Killen 1980: 15).

As mentioned earlier, the analysis of distinctive tool markings on wood can be utilised to identify tool type. The axe, adze and saw are famous for creating some of the most recognisable of these markings (Drdacky et al 2004: 35-36).

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[47] Axes are also referred to as *krdn* and *mibt* (Buccellati 1977: 9, Faulkner 1962: 104, 105, 281). Whether or not the different names indicate different functions is unclear and further study is required.

[48] The design mentioned here by Killen is often complemented by axe blades with rounded blades. For a comparison of blades refer to *Plate 23*. Iron blades represent far later developments in the carpentry industry, refer to *Plate 24* for examples from the Late Period. The blades are chronologically arranged from left to right; oldest to youngest. One should also pay attention to the difference between carpentry axes and military axes. Refer to *Plate 25.* The top row consists of model tools, while the second row consists of full scale items (both rows represent carpentry axes). The two bottom rows represent battle axes and their identifiable blades.

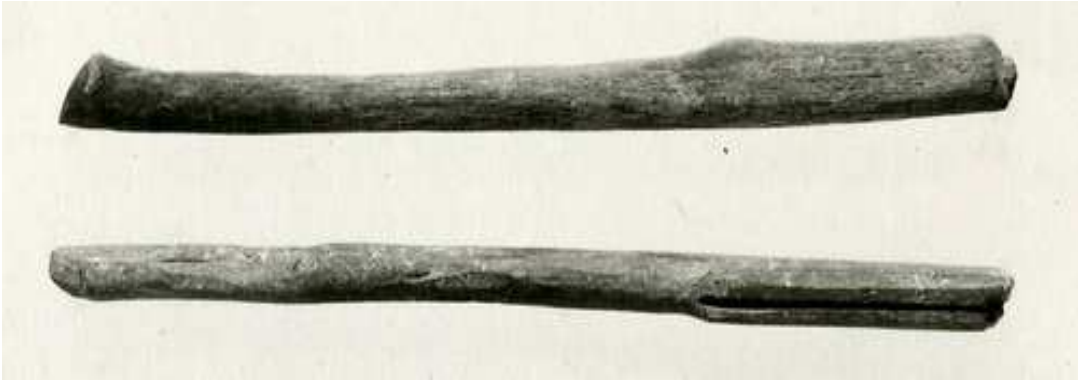

Image 15: *Axe handle from the 11th Dynasty.*

Axe size varies greatly depending on function. Not only the size of the blade, but also the length of the shaft, could vary between prototypes. For example, felling axes would have required larger blades and longer shafts in order to provide the lumber jack with the much needed weight and swing length to strike a forceful blow. At the other end of the spectrum, axes intending for trimming work would have relied more on the wrist action of the user and carefully aimed blows, while shaping axes appear to have had curved shafts. It is in this regard that Rogers (1996) speculates that axe size could have varied by as much as 20%.

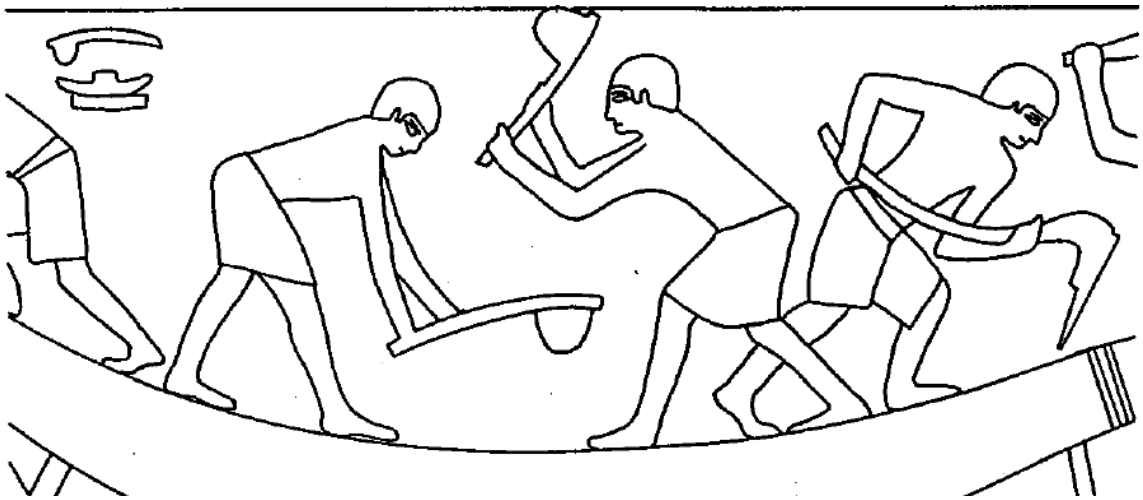

Image 16: *Shaping axes from the chapel of Khuenre. Note the rounded curvature of the shaft compared to examples seen in Images 8 and 9.*

4.4.4 Adzes

By far the most versatile tool in the ancient carpenter's tool kit, the adze[49] (*Plates 26 - 27*) was predominantly employed for planing but could also be used for highly accurate trimming and shaping (Baker 1966: 25, James 1984: 200). Originally the blades were made of stone[50] (flint), but were replaced by copper prototypes during Predynastic[51] times (Killen 1980: 13). These copper-cast[52] or later bronze adze blades were hammered into a flat shape, with some examples displaying dual cutting edges, while others possess only a single sharpened edge (Killen 1994a: 21). Along with this preference for cutting edges, the shape of the blade itself also underwent changes; earlier examples had rounded heads with a ridge below (Rogers 1996: 27) and straight sides, while later prototypes followed an even more rounded design with side lugs (Killen 2001: 517). Most importantly, the main operational difference between the adze and the axe is that the adze cuts parallel to the handle as opposed to perpendicular (Leospo 1987: 125).

The larger adze blades (*Plate 28*), originating from the 1st dynasty, and associated with large furniture, gradually changed shape over the centuries. While it continued to boast a flared body along with a straight cutting edge, the tool gradually became slightly necked below the rounded head of the blade. This narrowing tendency continued until the neck of the blade was one fifth of the size of the cutting edge. In contrast to these large adzes, smaller types were designed for delicate work, such as carving minute furniture legs intended for funerary models. These tools were specially designed from Predynastic times and remained in use throughout the ages (Killen 1980: 14 – 15).

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[49] *Plate 26*: The shape and curvature of the adze had a huge impact on the workability and maneuverability of the implement, which directly influenced the finished product. A collection of model adzes from archaeological deposits at the temple of Hatshepsut clearly illustrate the wide variety of adze handles and blade shapes. *Plate 27*: A beautiful example of a full scale adze comes from the 18th Dynasty site of Deir el Bahri.

[50] Although certain stone tools, such as saws and knives, were replaced by metal prototypes, stone continued to be used for certain implements (such as hammers) well into the New Kingdom (Leospo 1987: 125).

[51] The early use of adzes positions their appearance within local trades well before that of axes (Rogers 1996: 27).

[52] According to Killen (1980), copper cast tools only made their appearance during the dynastic age.

In contrast to the straight shaft employed in axe making, carpenters designed an angled 'L-shaped' head to which adze blades were attached. Once the blade was attached to the head of the shaft, the completed tool would resemble a modified t-shape. Not only did the head of the shaft provide a perfect surface on which to attach the flat adze blade, it also provided a convenient cutting angle, allowing for an easily manoeuvrable downward scraping or controlled chopping action. By comparison, adzes from the shipping industry present us with two different handle types; one in the shape of a swan's neck, and the other resembling a candy cane (Rogers 1996: 27). Though adze types may share some close similarities between the two trades, no examples of the 'candy cane' adze have been identified from reliefs, paintings or models depicting furniture or cabinet making. We do, however, find the 'swan neck' adze depicted in scenes from the furniture industry.

Upon closer investigation of wall reliefs and paintings, one notices that the four adze types[53] seem to have had four different functions. The 'modified t-shape' adze appears to have been used within the furniture industry to shape a variety of angles, including diagonal, horizontal and vertical. The user could be positioned at varying angles, depending on the nature and shape of the item. The 'swan neck' was used both within the furniture and shipping trade, and was predominantly utilized to carve horizontal beams or items, while positioned above, or sitting directly on, the item. More specifically it was used within the shipping industry to carve the convex shape of the inner hull. In comparison, the 'candy cane' adze was used solely within the shipping industry, as its long shaft and uniquely designed head and blade presented the shipwright with the required length and angle to shape the convex hull of ships. Lastly, the 'modified candy cane' has a more rigid neck with rectangular angles, and appears to have been used to carve flat surfaces over larger areas.

The following series of images from Rogers 1996 clearly illustrates the above mentioned theory.

[53] The adze has also been identified as the tool used during the opening of the mouth ceremony. Adzes used in this context were referred to as *mshtyw, nw3, ntrty* and *dw3-wr* respectively, while the carpentry adze was known as *nwt* (Buccellati 1977: 3, Faulkner 1962: 118, 127, 143, 310).

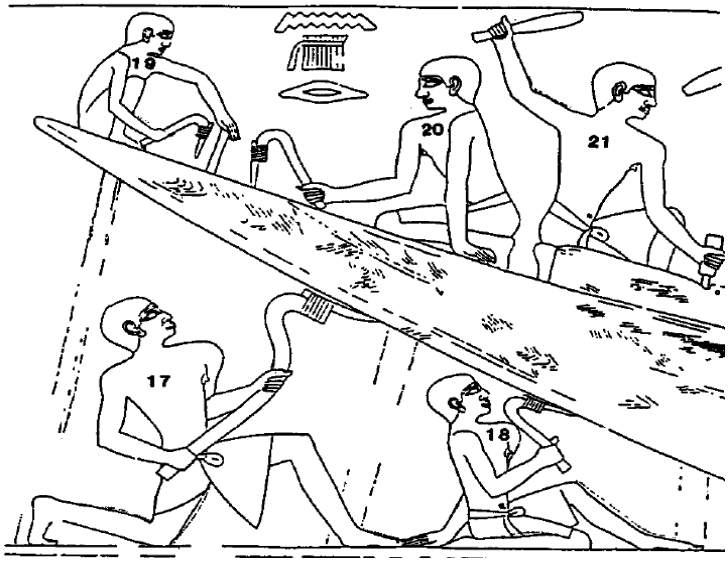

Image 17: *Ship builders at work using a variety of adzes. Both the 'swan neck' and 'candy cane' adzes are seen here. Tomb of Ty.*

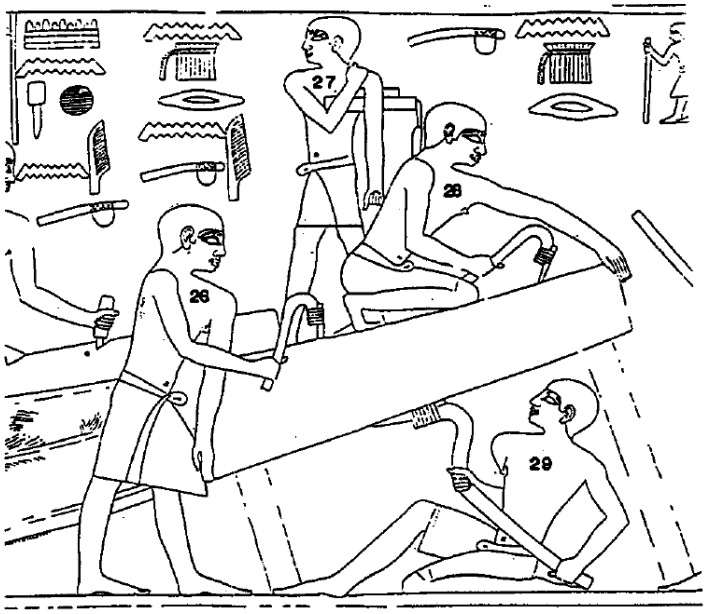

Image 18: *The images clearly illustrate the curvature of 'candy cane' adzes and their specialised application for carving ship hulls.* Tomb of Ty.

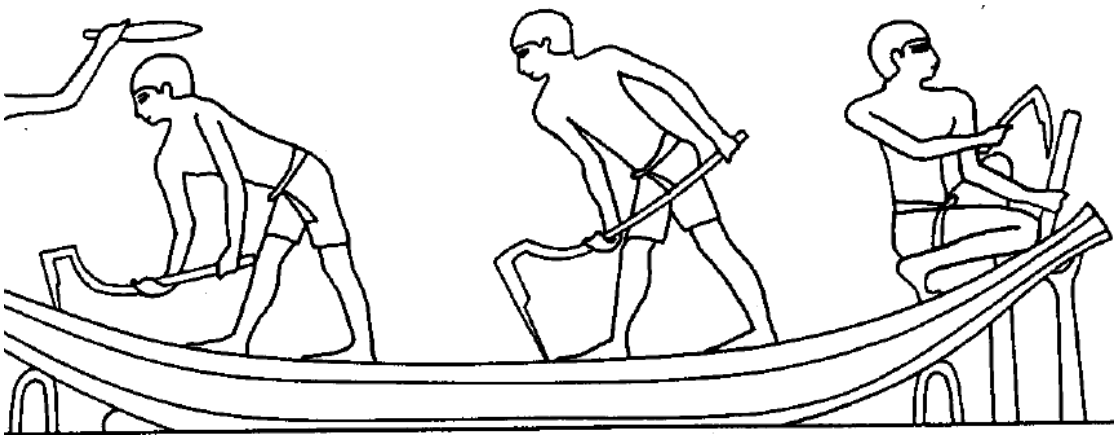

Image 19: *The 'modified candy cane' adze is seen here in use as a deck leveller. Tomb of Khunes.*

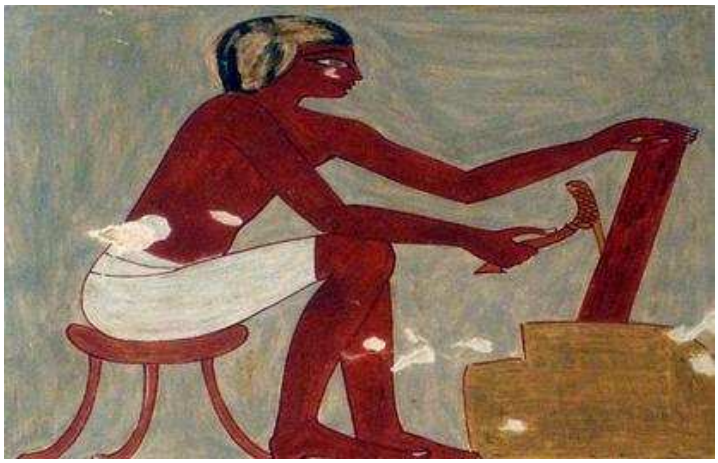

Image 20: *The craftsman in this mage is using the 'modified t-shape' adze, which is mainly used within the carpentry industry. Tomb of Rekhmire.*

4.4.5 Chisels and awls

We encounter a variety of copper chisels[54] from both Predynastic and dynastic Egypt. The ancient carpentry tool kit contained two types of chisels, namely mortise[55] and firmer chisels, which performed much finer work than either axes or adzes. The mortise chisel had a cylindrical handle with a flat top and possessed a well set square blade (that only partially penetrated the handle), that was relatively resistant to bending and warping. The mortise chisel was worked using a mallet[56], with well-aimed blows prising out bits of wood from deep mortises. Its main use then was to carve out the joints that would be employed to fit various inserts and sections together[57] (*Plates 29 - 30*) (Killen 1980: 16, Leospo 1987: 125).

The earliest examples of firmer chisels were manufactured from individual bars of copper, with the ends were forged to produce dual cutting edges. The carpenter would then hold the chisel half-way along the length of the blade and proceed to carve the object using only the pressure of his hand (Killen 1980: 16). This basic design later developed into what is known as the firmer chisel. By the 1st dynasty this carving tool possessed a rounded

[54] Chisels were known as *mnh* and *md3t*, and one specific example, *mdtft,* has been connected with the opening of the mouth ceremony (Buccellati 1977: 25, Faulkner 1962: 109, 123, 124).
[55] The mortise chisel was more specifically know to the ancient Egyptians as *mdja* (Atiya & El-Shahawy 2005: 84).
[56] During the Old Kingdom mallets were quite slender and only later developed into the rounded, short types know from the Middle and New Kingdoms (Rogers 1996: 35).
[57] *Glory of Ancient Egypt* 2002: 696.

handle with a thin blade. The handle itself suggests that the tool fitted neatly within the carpenter's hand, presenting him with the manoeuvrability needed to perform finer handwork and carving (Killen 1994a: 21, Killen 2001: 517). Due to its shape and size, it is thus suggested that the firmer chisel was used to round off joints carved out by mortise chisels, and to skilfully ebb out the finer details of decorative carving work.

In contrast to the chisel, the awl is rounded in section, as opposed to rectangular, and would have been used to punch holes into leather or to create rounded designs or holes in wood. More specifically, bradawls would have been used to create guide holes that would allow for the insertion of nails and pins[58]. This 'fluted' blade was usually much shorter than that of a chisel, and would have been inserted into a shorter, more rounded handle (Leospo 1987: 125).

It can thus be said that the shape and design of the handle varied from task to task, and that even in cases where the blade itself has become dislodged or corroded, one can still determine the function of the specific tool based on the shape of the handle[59]. To add to our overall understanding of Egyptian implements, we can also compare carpentry tools to variants found within the stonemasonry industry, such as the examples discussed by Arnold (1991). In general, the blades would have shared similarities between the two industries, with size being the main differentiating factor. However, when comparing these tools based upon technological differences, we find that carpentry chisels possessed wooden handles, while masonry chisels were left without handle covers[60]. In short, our awareness of these differences is crucial if we want to positively identify the specific tools used within the carpentry industry.

[58]Definition of the bradawl: http://en.wikipedia.org/wiki/Bradawl
[59] *Glory of Ancient Egypt* 2002: 696.
[60] This is because the heavy blows struck to masonry chisels would have split the wooden handle from its metal blade (Arnold 1991: 257).

4.4.6 Hammers and mallets

In order to create intricate designs and skilfully crafted joints, the carpenter required a versatile instrument that could deliver both heavy blows and delicate taps. The wooden mallet (*Plate 31*), originally created to work stonemason chisels, was redesigned to the specific needs of the carpentry industry. Compared to our modern mallet, the ancient prototype differed little (James 1984: 206), as it would have performed the same basic functions in ancient times as it does today. This simple design saw a solid block of wood carved into a domed shape, with a short, stubby handle providing a sturdy gripping surface (Killen 1980: 18). More specifically, the original Predynastic and Old Kingdom Mallets were rounded towards the top, while later Middle and New Kingdom mallets tend to possess flat tops[61]. This change in design is visible in both visual arts and material culture.

Because nails and pins needed a sufficient amount of force to penetrate the wood, the Egyptians used a variety of hammers[62] and pounders, such as the ones discussed by Arnold (1991). The hammer (*Plate 32*) was in ancient times a much simpler tool than today. The biggest difference is that it was used like a hand axe, and did not possess a wooden handle upon which the head was mounted. Hammers were thus rounded, smoothed stones that could fit quite comfortably in a man's hand.

4.4.7 Sharpening and honing instruments

The earliest tools were made of copper and so the soft metal blades required regular sharpening. Even with the introduction of much hardier bronze and later iron, the carpenter always possessed the correct equipment in case a tool needed sharpening. Slate was used

[61] Personal observation: Author.
[62] Although the concept 'to hammer out' appears as *km3* (Buccellati 1977: 69, Faulkner 1962: 278), no specific term is assigned to the hammer. This may be because the hammer was a simple pounding stone which could have been used for multiple purposes, both inside and outside the furniture industry.

effectively by suspending the stone itself from a hole drilled through the thickest end, thus allowing the slate to hang vertically. This allowed the carpenter the freedom to use both hands while sharpening his blade. A small amount of oil would lubricate both tool and the stone, thus providing a smooth, workable surface. This sharpening, or honing action, caused the slate to become narrow towards the centre through continued use. This characteristic shape, along with clearly visible scoring marks, allows us to distinguish this implement from other work-bases (Killen 1980: 18).

4.4.8 The drill

In order to create the rounded holes needed for dowel joints, or to fasten rawhide lacings and woven rush seats, the ancient carpenters required a tool that could drill directly through the wood. For this purpose the Egyptians made use of a simple, yet highly effective bow-drill[63] (*Plate 34*), which was already well known during the Old Kingdom (Rogers 1996: 36), and developed from the bow and arrow during Predynastic times. The regular use of the bow-drill by the 5th dynasty is supported by the relief carving from the tomb of Ty (Killen 1980: 20).

The mechanisms behind the bow drill were originally harnessed to make fire, with the earliest carpenters realizing that it held the potential to drill holes. The implement now employed for carpentry was fairly simple in design with a cord strung between the two ends of a curved wooden bow, leaving enough slack in the cord for it to be wrapped around the drill-shaft once. As the bow and cord rotates the drill-shaft (or stock) in alternating directions (clockwise and anti-clockwise), the device is then kept in balance through a stone cup (also known as a hand hold or bearing block[64]) which is held firmly at the top of the drill-shaft. The

[63] Tomb paintings illustrating the use of the bow drill within the carpentry industry. It is identified in texts as *wb3* (Buccellati 1977: 44, Faulkner 1962: 58).
[64] This item could also be made from a dom palm nut shell, as the rounded shape provided a natural cup. The bow cord itself could be made of linen, papyrus or rush (James 1984: 203).

weight applied to the stone cup by the drill operator then enables the copper drill-bit[65] to penetrate the wood (Goodman 1970: 69, James 1984: 203, Killen 1994b: 33).

To create minute holes, or to drill through thin sheets of wood or other materials, the ancient carpenters made use of a bradawl. This small tool, predating the bow drill by some centuries, would have been used in a similar fashion to that of firmer chisels, and operated without a mullet via the application of steady pressure to the wood surface. The bradawl could also be used as a marker to indicate the position of holes to be drilled by the bow-drill (Killen 1980: 22).

4.4.9 The lathe

Although numerous items of Egyptian furniture appear to have been turned on a lathe, this advanced piece of technology made a much later appearance in carpentry shops. The earliest suggested use of the lathe comes from the New Kingdom, but the first archaeological evidence of this implement only appears in the Hellenistic Period[66] (Leospo 1987: 125). The general consensus is that the main developmental phase of the carpentry lathe only occurred during the 5th century BC (Fagan 2004: 75, Oates 1981: 18).

4.5 CONCLUSION

From the selection of trees for felling, to the sawing, stacking and drying of beams, each step in the timber preparation process played a role in the quality of the end product and its longevity throughout the ages.

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[65] It is possible that drill bits were originally made of flint and that they were later replaced by copper prototypes. Judging by archaeological dates obtained for the earliest known examples of such metal technology (from Tell Asmar, Diyala regions, Mesopotamia) we can place the introduction of copper drill bits around 2350 BC (Gwinnett & Gorelick 1987: 15), with Egyptian carpenters following suit shortly thereafter. Although the crank drill appears in tomb painting from the 3rd to 26th Dynasties (Hartenberg & Schmidt 1969: 155), this drill's uneven penetration surface would have been undesired within the furniture industry, restricting its use to the creation of stone vessels.

[66] Visual evidence originates from the 4th century BC tomb of Petosiris at Tuna el-Gebel (Leospo 1987: 125).

A study of the evolutionary development of the ancient carpenters tool kit uncovered the technical development of key items including axes, saws, adzes, chisels and hammers. The metal from which these tools were created was identified as a primary role player in the evolution of the tool kit, linking the development of tools to the introduction of new materials via international trade.

The evolutionary development of the tool kit was mirrored by the development of intricate joinery methods. This dual development was the result of a symbiotic relationship between workmanship quality and tool versatility. While the evolution of better, stronger tools allowed the carpenter to create more intricate joints, the desire to perfect joinery in turn inspired tool designers to develop custom instruments. These professional tools would later become highly specialised, replacing general or common tools with trade-specific types.

This evolutionary process is insightful when tracing the chronological development of the furniture industry, as different styles can be assigned relative dates based upon their dependence on certain period-specific technological developments. For example, certain design aspects could only have been the result of a combination of specialised tool use and advanced carpentry methods. In short, improved tool quality led to a higher degree of accuracy, which in turn led to the development of new production methods and technologies.

In our next chapter we will look at some of these methods and technologies and how they influenced the ancient Egyptian furniture industry.

CHAPTER 5

PRODUCTION METHODS AND TECHNOLOGIES

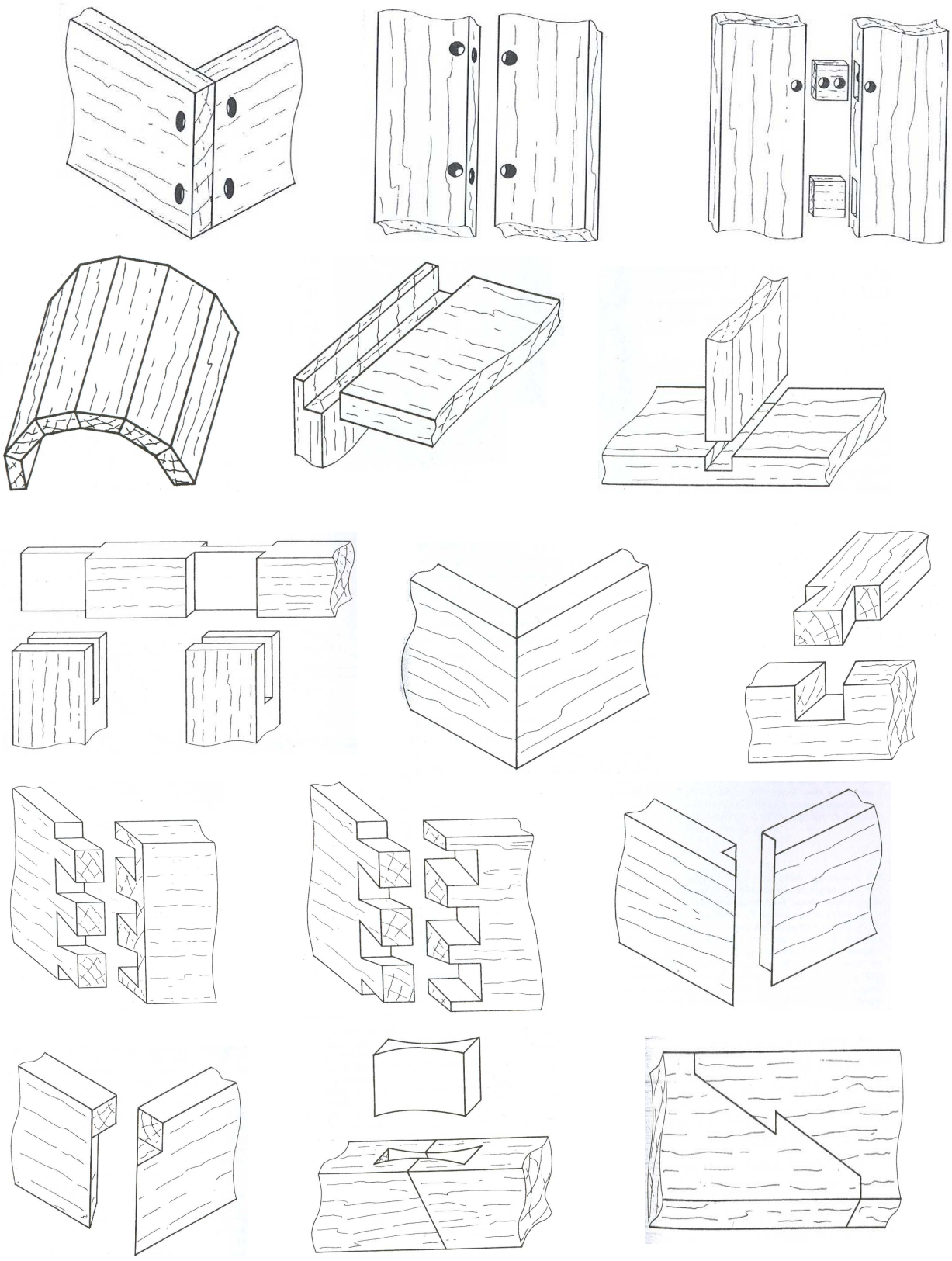


Image 21: *Joints used by the ancient Egyptians including (from left to right): butt, edge, edge, cooperated, half lap, housing, bridge, simple mitre, single dovetail, lapped dovetail, common through dovetail, dovetail shoulder mitre, butt joint on plain mitre, common scarf and spliced scarf.*

5.1 INTRODUCTION

Along with the evolution of the tool kit came the development of more sophisticated and complex production methods and techniques. In most cases the production methods and techniques can be given a relative chronology, as they are directly connected to the tools that created them.

Joinery was an integral part of carpentry and played an important role in assuring strength and stability. Different joints were used for specific applications, such as securing the rails of a bed or fastening an angled backrest to a chair. Although these joints were functional and strong on their own, additional support was often required and took the form of pins, nails, lashings, glue and metal brackets. Seats could be made of rush, leather or upholstery, while decorative designs could range from colourful wooden inserts, gold foil and ivory inlays, to semi precious stones and ancient imitations.

All these methods and technologies developed within the ancient carpenter's workshop and it is important that we understand the day-to-day circumstances in which the furniture industry functioned. A look into the carpenter's workshop will therefore help us to place ourselves within the working shoes of an ancient artist.

5.2 JOINERY

> *Patience, care and attention to detail provide the key to accurate joints; an understanding of how they work will allow you to choose the correct type for a given job. The techniques of joining wood have been developed over the centuries…*
>
> Corbett 2007: 107

The ancient Egyptians were aware of the attention to detail required in perfecting joinery and employed a variety of methods including, mortise and tenon joints, half-lap joints, butt

joints, rebated butt or lap joints, saddle joints, scarf joints[67], butterfly cramps, dovetailed mitre-housings, as well as shoulder mitres and double shoulder-mitres (Blakemore 2006: 15, Killen 1994a: 114-15, Leospo 1987: 125). Of these, saddle joints, lap joints, mortise and tenon joints as well as dovetail joints, were already well known during the Old Kingdom (Baker 1966: 19, Burrows 2005: 4). In addition, we are aware of the frequent use of wooden dowels and large metal studs[68] to join various sections and inserts.

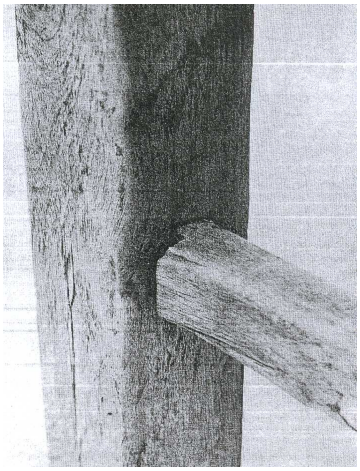
Leospo (1987: 95) states the following regarding joint analysis:

> *The methods of joining the various parts of the object are various and are used in all periods, in such a way that they themselves cannot be used as dating criteria.*

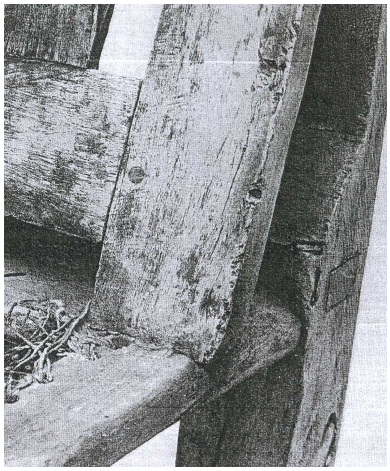
We know that the different technological developments within the tool making industry itself would have led to the creation of more complex joints, which can, in effect, be placed within a relative chronology. This theory is supported by a number of arguments detailed below.

With the introduction of the copper handsaw, ancient carpenters could now produce intricate joints, and with the aid of try squares, cubit rods and cutting aids (similar to modern mitre boxes) joinery became a very precise and accurate craft. Larger items of wood were also fastened to support struts in order to lend the carpenter a wider range of movement during the joint manufacturing process. Of these joints, rebated or lap joints were the most commonly applied when joining smaller items, while mortise and tenon joints provided strengths to larger items (*Image 22*).

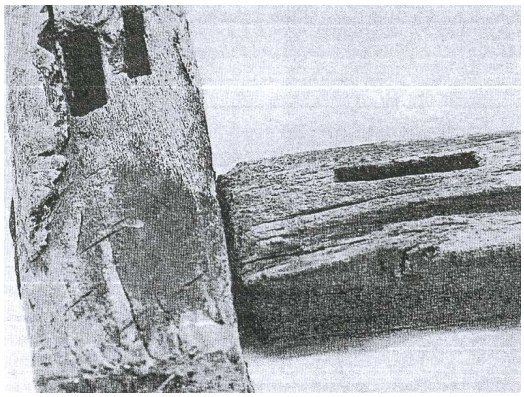
[67] Scarf joints came into use during the Middle Kingdom when carpenters joined together shorter pieces of wood to form extended lengths. In this method two pieces are joined end to end by means of a dove tail insert (Blakemore 2006: 13-14).
[68] Gold studs were used from the 18th dynasty onwards (Killen 1994a: 18).



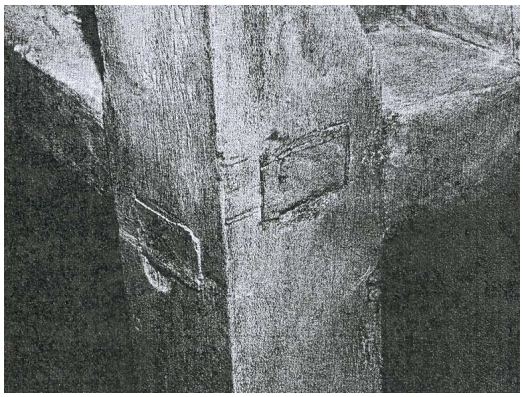
Joint with barefaced tenon



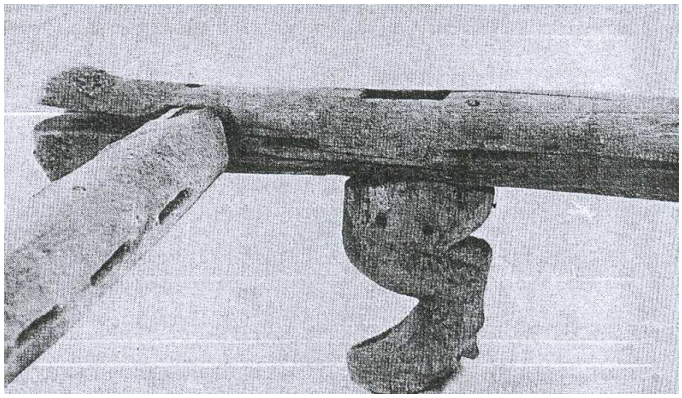
Stub tenon joint



Common through mortise



Barefaced tenon with single shoulder



Common through mortise and tenon

Image 22: *Examples of joint application in ancient Egyptian furniture.*

This popular method of joinery was employed from the 1st Dynasty onwards, with older versions characterised by their square or moulded tenon shoulders, while New Kingdom prototypes were bare faced with stubbed tenons (Killen 2001: 517-518). Because local timber rarely produced long beams, ancient carpenters had to join shorter beams together in order to reach the desired length. For this purpose mortise and tenon joints were most commonly used (Baker 1966: 19).

When it comes to half lap or halving joints, this classic method of joining allows pieces of wood to intersect, thus forming strong, square connections (Corbett 2007: 109). To add to the advantage of physical strength, these joints are also fairly simple to make and can be used for a variety of practical purposes (Campbell 1989: 56), especially cabinet making.

In the case of dovetail joinery, structural functionality is combined with decorative appeal (Corbett 2007: 114), owing to the nature and shape of the dovetails. Crafting the joints requires a high level of skill, combined with a relatively hard wood and sharp hand saw. It was thus due to these specific requirements that dovetail joints were only in use from the 4th Dynasty onwards (Ward & Zazzaro 2010: 38). In addition to the dovetail technology originally developed by carpenters, later advances[69] in joinery made by the ship building industry may have filtered back into the furniture industry. Given this transmigration of methods, we would most likely encounter dovetail joints within the furniture industry resembling those used on the inner surfaces of ship hulls (Edgerton 1923: 128). According to Ward and Zazzaro (2010), these joints would have been flat or uncurved, making them easily distinguishable from modern dovetails[70], which often change angles along their length. Furthermore, although the physical size of ship building and furniture joints differ, we can gain valuable information by conducting interdisciplinary studies which focus on similarities between these two industries.

Along with the standard joints, the ancient Egyptian carpenter could also alter joints to meet specific requirements. An ideal example of such a joint comes in the form of a modified mortised housing, designed to support the top rail of a bed canopy from the time of Queen Hetepheres (4th Dynasty) (Burrows 2005: 43).

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[69] Dovetail joinery was only employed from the late 19th century onwards by craftsmen reassembling and replacing worn out and decaying mortise joints on the Dashur mortuary boat (Ward & Zazzaro 2010: 38).

[70] This information is crucial to our study of ancient furniture, as we, in our pursuit to reconstruct ancient artefacts, should be able to readily identify that which is ancient, and that which is modern. This is because items of furniture were reconstructed during the late 1800s and early 1900s without proper documentation being made. A more detailed discussion on this matter will take place in the final chapter of this dissertation.

In order to improve the above-mentioned joinery methods, wooden dowels could be incorporated into the design of almost any joint, allowing for greater support and longevity. These wooden rods were used from as early as the 2nd dynasty and the technique was later combined with the application of glue[71] to provide unparalleled strength (Killen 1980: 10).

Complementary to these forms of joinery, we also see the use of metal pegs, pins, nails, tacks, braces, brackets and angle pieces (*Plate 35*) to provide strength, especially where angled sections require additional support. Lattice bracings and stretchers, also used for added support, are said to have appeared first during Middle Kingdom (Manuelian 1985: 103). One of the best examples of an angle bracket comes from the Middle Kingdom town of Kahum, where Flinders Petrie discovered a chair with animal shaped legs and a slanting back rest. An angled bracket positioned the slanting backrest along the side rail of the seat, while tiny dowels secured the construction (Killen 1994a: 40).

5.3 SUPPORT SYSTEMS

5.3.1 Pins and nails

Nails, as we know them today, were in use from the 1st Dynasty in construction and other carpentry works, but only became widely used within the furniture industry during Tutankhamun's reign. Before this time, simple metal pins were used to affix coverings, sheathings and the like, with metal studs (used as pin coverings) giving them the appearance of nails (Scott 1965: 129). Pins were used in many instances to secure seat covers, veneer strips, or certain decorative elements, while nails (*Plate 36*) would have been used to strengthen joints. From the 18th dynasty onwards, more extravagant golden studs were also used to strengthen joints (Killen 1980: 11), while at the same time serving a decorative purpose by covering unsightly nails or pins. Furthermore, gold foil could also be

[71] The gum produced by *Acacia senegal, Acacia seyal* and *spirocarpa* was often used as an adhesive (Leospo 1987: 120), perhaps as an alternative to animal-based glues.

used to cover nails, as was the case with silver nails from Tell Brak in northern Syria (Oddy 1981: 75).

5.3.2 Lashings, glue and gesso

As an alternative to metal supports, the ancient carpenter could have made use of thongs and lashings[72] to support joints. During the Old Kingdom the use of lashings was combined with the application of glue to settle the lashings securely in support of the joint. From the tomb of the 4th dynasty Queen, Hetepheres, we encounter examples of both methods, though it is believed that the adhesive used in this instance may actually have been gesso and not glue (Killen 1980: 9).

This combined practice was continued for centuries, but was replaced during later years, as animal glue became a popular adhesive in the furniture industries of the New Kingdom (Killen 1994a: 18, Leospo 1987: 125). These natural glues were organic based adhesives, developed during the 5th Dynasty and manufactured through a process of boiling together skin, bone and water, allowing the moisture to evaporate, thereby leaving only a thick viscous liquid (Campbell 1989: 76). This thickened adhesive would then be cast into ingots and allowed to set into a firm shape. The ingots could then be transported with ease to carpentry shops across the country, where they would be smashed into smaller pieces, and returned to their liquid state through a reheating process (Killen 1980: 9). The glue could then be applied (by brush) to the joint sections prior to assembly, thus allowing the glue to set the joint firmly in place as it dried.

A visual illustration of this application process comes from the 18th Dynasty tomb of Rekhmire, Thebes. In one of the upper registers a small pot is seen brewing over a low fire with, what appears to be a brush, barely visible over the rim of the vessel. The image partially confirms that glue was stored in solid form and melted prior to application. To the right, a craftsman is seated on a three-legged stool and is busy applying glue to a thin piece

[72] In some instances twisted gut or thin copper wires could be used instead of lashings (Leospo 1987: 125).

of wood veneer. Another individual is seen grinding a white substance into a fine powder. The substance is most likely plaster, otherwise known as gesso (James 1984: 202).

For the ancient Egyptian carpenter, gesso fulfilled many practical functions. This mixture of whiting and glue (or a natural adhesive such as gum or resin) would result in a fine, multi-purpose plaster. Gum from the tomb of Tutankhamun has been identified as acacia gum (Hepper 2009: 20), indicating that bi-products from the timber industry could be used in various other manufacturing sectors. More specifically it is believed that gum was mainly obtained from *A. nilotica* (Hepper 2009: 22).

From early dynastic times it was used to attach decorative inlays to wooden items, while being utilised during the New Kingdom to affix gold foil to a timber base. It could also be used to cover inferior quality wood or shoddy workmanship, or serve as a base coat for paint (Blakemore 2006: 14, James 1984: 202, Killen 1980: 9). A thinned mixture of whiting and gypsum could also be applied as white paint or whitewash, and is most commonly encountered in tomb furniture[73]. Coloured paint was used to cover up inferiorities in wood surfaces, along with creating decorative effects (Blakemore 2006: 14), whereas white paint often served as a substitute for ivory (Eaton-Krauss 2008: 73).

Image 23: *Glue application from the tomb of Rekhmire*

[73] Although white painted furniture was commonly encountered within tombs, Eaton-Krauss (2008) mentions that white painted furniture was not solely reserved as grave goods.

5.3.3 Metal hinges

From early times box lids were fastened using a combination of mushroom-shaped knobs[74] and lashings, with clay being used to seal the lashings, thereby providing some level of security to the contents. Yet, with the exceptional ingenuity of Egyptian carpenters, this rudimentary system was replaced by a more complex design of wood and metal hinges during the New Kingdom (Killen 1980: 11). The ingenious design of interlocking cylindrical barrels, connected through either wooden dowels or metal rods, allowed boxes and chests from the 18th Dynasty onwards to swing open in much the same fashion as modern-day examples. The technology soon became widely used for a number of different applications, with one of the finest examples taking the shape of an intricate folding bed from the tomb of Tutankhamun (Killen 1994a: 18). Despite the wide application of these hinges[75], the majority of people still preferred loose removable lids for chests and boxes (James 1984: 199).

5.4 RUSH, LEATHER AND UPHOLSTERED SEATS

Abundant supplies of reeds and rushes allowed the carpenter in Ancient Egypt to take full advantage of the technologies developed in the basketry industry. With woven rush products provided a cheap alternative to expensive leather or upholstery, numerous middle/lower class items of furniture, including chairs and beds, possessed rush seats or covers. The use of reed and rush inserts for wooden furniture also represents the continued use of a raw material which, at one stage, constituted the predominant material from which primitive furniture was created. Yet, despite the continued popularity of woven products, the leather industry expanded rapidly from Predynastic times onward, with domesticated animal skins being used to make lashings, straps and webbing for a variety of purposes. While

[74] Refer to Chapter 4 for examples of boxes and their lids.
[75] Per example, metal hinges can be seen on the boxes and chests discussed in chapter 4.

leather straps were predominantly used to strengthen joints, the use of lashings, as webbed seats and bed frames, became popular during the New Kingdom.

As a more expensive and luxurious alternative to woven rush or webbed lashing seats, the upper class and royal elite could afford to have chairs covered with comfortable seats made from leather straps or woven cords. Woven flax linen, produced from Early Dynastic Periods onwards, provided colourful alternatives for those who could afford it, with leopard skins specially imported from Nubia and the Sudan (Killen 1994a: 11), while the feathers of waterfowl and other wild birds provided plumped-up seating for delicate royal posteriors.

5.5 DECORATIVE ELEMENTS

5.5.1 Inlays

The ancient Egyptians spared no expense when it came to decorative elements, acquiring gold, turquoise, lapis lazuli, onyx, silver carnelian, ivory, faience, glass, and a multiplicity of other colourful wares from both local and international sources (Blakemore 2006: 14). Their love for extravagance and visual splendour inspired some of the world's most recognizable pieces of furniture, with Tutankhamen's throne perhaps representing the apex of museum collections.

Image 24: Hieroglyphic faience inlays, Roman Period.

5.5.2 True stones and ancient imitations

Research into the lapis lazuli, turquoise and carnelian trade has shown that these semi-precious stones and minerals were imported from Mesopotamia, with the trade monopoly shifting from northern to southern Mesopotamia during the Jemdat Nasr Period (3200- 2900 BC) (Herman 1968: 36). With these goods representing some of the most popular materials for inlays, widespread use of the items only diminished for a short length of time[76], ranging from the beginning of the 1st Dynasty (3100 BC) to the end of the 3rd Dynasty (2686 BC) (Crowfoot-Payne 1968: 58). Afterwards, and throughout Egypt's history, lapis lazuli, turquoise and carnelian continued to play important roles in both the jewellery and furniture industry.

To be more specific, semi-precious stone and minerals were mined in the Badakhshan province of Afghanistan for close to 6000 years[77], with the site of Shortughai in the Oxus valley supplying turquoise, lapis lazuli and carnelian (Postgate 1999: 208). Masshad[78], the capital city of the Khorasan province, Iran, was also well known for its turquoise and probably exported a variety of like goods via the Great Khorasan road, linking the central Iranian plateau with the rest of the Ancient Near East (Majidzadeh 1982: 59). Closer to Egypt, the Siwa Oasis in the western desert of Libya provided a more local supply in lapis lazuli, while mines in the Sinai Peninsula met the demands for turquoise. As a result of this long-distance trade, and because of the high demand for the semi-precious stone and colourful minerals elsewhere, lapis lazuli, turquoise and carnelian in ancient Egypt were luxury items. Yet despite the cost, genuine examples of these goods were widely used in the furniture and works of art destined for the royal halls. On the other end of the financial spectrum, however, lower ranking officials and individuals from everyday walks of life could opt for cheaper substitutes of the popular decorative elements.

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[76] This corresponds with the dates given by Herman (1968), placing to collapse of international trade, due to internal Mesopotamian politics, within the E.D I Period (2900-2700 BC).
[77] http://en.wikipedia.org/wiki/Lapis_lazuli
[78] http://en.wikipedia.org/wiki/Turquoise

The Egyptians were some of the first people to produce artificial/imitation versions of lapis lazuli, turquoise, carnelian, and other semi-precious stones[79]. These imitations came in the form of highly colourful faience and glass exemplars, with the exceptional quality of their production making it hard for the untrained eye to recognize the difference between an original and a fake. To determine this authenticity, the ancient crafter had to identify the specific mineral that gave the original stone its unique colour and appearance. Once these secret natural ingredients have been identified, the various compounds can be incorporated into the production process.

Egyptian faience (*Plates 37 - 40*), unlike Italian glazed earthenware faience, was made from a mixture of quartz, limestone, clay, natron and water. The colour was attained through applying special colouring materials either as a powder (which would melt on the surface), or as a compound within the core paste itself. To attain the unique colouration of each of the semi-precious stones mentioned above, specific combinations of minerals could have been incorporated in faience production (*Table 24*).

This very combination of selected chemicals, and the resulting colouration and texture, can help us to establish a relative chronology for ancient Egyptian furniture. The very colour of the faience (and glass for that matter) can give us insight into production period, as certain colours were period-specific[80] (Hall 1930: 47).

Following in the footsteps of faience, glass could also be used as a substitute for expensive originals. However, glass imitations may have appeared later than their faience counterparts, as glass is said to have appeared only around 2300 BC (Luckner 1994: 79), with the exact location of discovery remaining elusive. Furthermore, true experimentation with glass and frit, which led to the growth of this industry, only occurred somewhat later

[79] Imitations were first created out of economic need, when original stones were unaffordable (Leospo 1987: 124). Yet, the popularity of these imitations soon spread across society, even to those who could afford the original stones. This could have arisen from the wide variety of colours available, and the creative expression of polychromy it allowed.

[80] An example comes from the study of Ptolemaic faience using various non-destructive scanning technologies (discussed in chapter 6). Types of glazes and fabrication techniques were identified as being unique to this period, creating a chronological benchmark to which comparisons to earlier faience can be made (Mao 2000: 185). The same analytical process can be followed to establish a chronological framework for glass based upon chemical analysis (Shortland & Emerin 2006: 581).

around 1600 BC (McGovern et al 1993: 1). Yet, despite the possible differences relating to chronology, the technology behind colouration would have differed only slightly between faience and glass, with Luckner (1994: 79) providing us with the main reason why glass was originally held in such high accord.

> *Many of the colours of glass seem to reproduce the appearance of semiprecious coloured stones prized in the Bronze Age – the blues of lapis lazuli and turquoise and the reds of carnelian and jasper. Thus, glass was first treasured because of its ability to mimic other more valuable materials.*

Although glass may have played a substitute role for other, more expensive, materials, glass inlays are often found amid a variety of precious materials, such as gold, silver and ivory, thus confirming the high esteem with which the ancient Egyptians viewed this colourful, malleable substance (Luckner 1994: 80).

Calcite could also provide a colourful, shiny inlay, closely resembling the appearance of glass. The main characteristics by which the two are distinguished are as follows: the exceptional clarity of the coloured pigment, along with a glazed appearance indicates glass, while a softer, polished appearance indicates calcite (Eaton-Kraus 2008: 31). With regards to its specific application, darker calcite could be employed as an imitation of carnelian, while the unique yellow forms of calcite served to represent the golden sun (Eaton-Krauss 2008: 30).

5.5.3 Ivory

Perhaps best known for its dense grain, smooth finish and creamlike appearance, ivory was most commonly employed within the furniture industry as a contrasting inlay to the rich, dark hardwood, ebony. Great lengths were pursued in order to obtain this precious commodity from as early as 4000 BC (Killen 1980: 8), with traders procuring large cargoes of elephant

tusk from Nubia. This lucrative import of ivory saw its increased use in the manufacture of small furniture legs, such as those designed for game boards, cosmetic boxes and small-scale furniture models.

Two kinds of ivory were used by the ancient Egyptians. The first, elephant ivory, seems to have been the more popular choice, as its scarcity would have increased its allure and status as an item connected with royalty. But, as seems to be the trend in ancient Egypt, cheaper substitutes such as hippopotamus ivory became popular as a slightly cheaper and more readily available alternative to elephant ivory. Not only was this a trend in ancient Egypt, but also in localities such as Knossos and Mycenae in the Aegean from the Bronze Age (Krzyskowska 1988: 210).

One of the simplest ways of determining whether or not an item is made from elephant or hippopotamus ivory is to establish if the item has been stained by ancient dyes. According to Killen (1980), it is impossible to stain hippopotamus ivory, thus allowing us to identify elephant ivory from their stained designs. In cases where ivory is clearly untreated, it becomes slightly more difficult to determine its true identity, with microscopic analyses representing the best option.

In contrast to the use of these expensive inlays, carpenters could also consider using bone, as highly polished cream-coloured surfaces provided a life-like ivory appearance. These inlays could take either the form of geometric designs with simple motifs (*Plate 41*), or they could be shaped into animal, human or mythological shapes (*Plate 42*).

5.5.4 Gilding and foilwork

Goldwork (*Plate 43*) is perhaps the one decorative art that remains synonymous with royalty, and was first employed in the decorative arts around 3000 BC (Oddy 1981: 75). With gilding, layers of exceptionally thin gold foil are applied to the surface of an item, relying on the mechanical effect of the application itself to secure the foil to the item. In

many instances, ground gesso was used to help secure the foil to the wood (Blakemore 2006: 14, Oddy 1981: 77). The completed work was then covered with a clear adhesive solution, which would permanently affix the gold foil to the item (Killen 1980: 9). It is believed that the technique of beating gold into a thin foil was developed by goldsmiths during the New Kingdom, with supporting textual evidence provided by the funerary papyrus of Nefferronpet, 14th century BC (Oddy 1981: 76).

In contrast to this thin application, thicker gold sheeting was pre-shaped and applied to furniture items using pins and nails (Blakemore 2006: 14), and became a more popular method of gold-work during the 18th dynasty (Killen 1980: 9-10). Some of the best examples of gold furniture include the gilded beds from Tutankhamen's tomb and the gold sheeted royal bed of Queen Hatshepsut.

5.5.5 Marquetry and veneer

One of the simpler, and more affordable options was to create complicated designs using different wood species boasting contrasting colours. Marquetry inlays, created solely from timber inserts, were on average between 2 – 4mm thick and kept in place using either resin[81] or animal glues (Killen 1980: 8). In general, a decorative distinction is made between marquetry, which is more representational, and parquetry, which has a geometric focus (Blakemore 2006: 14).The ancient Egyptians were highly skilled at both design formats, with some creations containing thousands of individual pieces of wood.

Similar in technical composition to marquetry, wood veneer consists of timber strips, with an average thickness close to that of marquetry. Despite the similarities between the two techniques, there are also major differences. First, marquetry is incorporated as a decorative element that relies on the variation between wood colours, while veneer is mostly

[81] Resin was used from the earliest of times as a natural adhesive but was later replaced by animal glues during the New Kingdom (Killen 1980: 8). It seems that the use of clear or opaque glues would have held substantial benefit, as the use of timber resins would have run the risk of staining wood in an undesirable colour.

used to cover inferior quality wood or poor craftsmanship. Second, while marquetry is affixed to the furniture piece by inserting it into recesses carved from the surface of the wood, veneer is simply glued, doweled or pinned to the surface (Blakemore 2006: 14, Killen 1980: 8). Exceptionally thin (3-4 mm) veneer leaves, known as 'flitches', stand as testimony to the ancient carpenter's prowess in creating quality veneer from hard woods such as ebony and cedar (Leospo 1987: 126).

Alongside veneer and marquetry we also encounter the use of both plywood and bentwood. With plywood, multiple layers of wood are conjoined to form a single length of wood. While later carpenters secured these layers by gluing them together, their earlier counterparts simply relied on pins to keep the construction intact. As with modern plywood, the ancient carpenter ensured that the grain of each layer of wood ran perpendicular to the next, thereby providing extra strength and preventing warping. In the case of bentwood, young saplings or thin branches were pre-bent into the desired shape prior to felling in order to produce rounded or curved slats (Blakemore 2006: 14-15).

5.6 RESINS, STAINS AND VARNISH

Natural oil resins, such as cedar oil and gum arabic, were used during early times, but it was only during the 18th Dynasty that mention was officially made of the practice in documentation. These liquids could be either translucent, opaque or black (Leospo 1987: 126).

The dark natural resin known as crude bitumen[82] had a dual purpose. First, it was used to cover inferior quality wood, while at the same time providing a rich, dark colour that could easily have been mistaken for ebony at quick glance (Leospo 1987: 126). Second,

[82] Author's note: It is believed that the resins used within the furniture industry (such as bitumen) originated from the mummification trade, and that some form of exchange could have occurred between the two sectors. The similarity between bitumen furniture coatings and the preservation liquids used in mummification suggest a definite connection. Because most ancient resins were derived from plant materials, more specifically from timber, it seems natural that both trades should utilise the same resource. Conveniently, Baumann (1960: 84-104) provides us with a list of identifiable botanical species associated with mummification.
Plus, evidence has shown that saw dust and wood chips were used to dry out mummies (Asensi et al 1998: 228, Lucas 1931: 13), making the furniture industry one of the most obvious suppliers of this local commodity.

and perhaps quite ‘accidentally’, bitumen also provided a protective layer against deterioration and decay. Whether or not the ancient Egyptian realised the preservation potential of mummification chemicals at first glance, or whether they only discovered this beneficial property after centuries of application, remains uncertain.

The original artificial colouration that inspired the use of bitumen may have taken a much simpler form, namely, ebonising, a technique by which soot is diluted in water, and then applied in multiple coats to the wood (Killen 1980: 9). This would have given the wood a dark colouration, but would not have protected the timber in the same manner as bitumen.

In contrast to the disguising character of the above-mentioned liquids, clear varnish was designed to provide a clear coat to timber of a much higher quality. It was also used to protect painted items from cracking, scratching and overall colour fading. These varnishes were manufactured by melting soft resin and oil together until it formed a sticky viscous liquid. Another form of coating, known to the ancients as ‘black varnish’ (a man made bitumen), was made from a heated mixture of oil and pitch/asphalt, and was applied using a brush. In the case of most varnishes, the mixture had to be applied hot in order to prevent premature setting and to facilitate a greater absorption rate. In conjunction with this, beeswax was often used as polish to protect the wood (Killen 1980: 10, Leospo 1987: 126).

5.7 THE CARPENTER’S WORKSHOP

> *Every carpenter who picks up the adze is more tired than a peasant. His field is the wood, his hoe is the axe. There is no end to his labour. He has to work more than his arms are capable of. At night he lights a lamp to continue working.*
>
> The Satire of trades
> James 1984: 196

The antiquity of woodwork is indicated by its use as primary the architectural material prior to the introduction of stone, and the high position held by carpenters in society. Their skill

was so highly admired that the position of “overseer of the royal axe” was awarded to the leading craftsman of the time. The title has been described as the Archaic equivalent of “royal chief architect” (Leospo 1987: 122). In later times the title was changed to “superintendent of the royal carpentry works” (Leospo 1987: 126).

Several highly skilled workers, including joiners, general carpenters, cabinet makers and other craftsmen, worked together under the supervision of a scribe and overseer. These official state or temple-run industries employed highly skilled labourers who could perform special tasks such as precious stone inlaying or delicate filigree work. One such example is the workshop managed by the Temple of Amun in Thebes, which is mentioned in the 18th Dynasty texts[83] of Rekhmire (James 1984: 196).

Although state or temple-run workshops were the norm, individual carpenters could be self employed, producing everyday items for the local market. In most cases the skills required to create success within the industry were passed on from father to son, as shown by the painted limestone stelae from Deir el-Medina; depicting the master carpenter Didi and his son[84] (Burrows 2005: 42).

Our best visual examples of carpenter’s workshops, as we shall see below, arise from the exceptionally detailed scaled models and tomb paintings throughout Egypt’s colourful history. Some of the oldest examples of carpentry scenes originate from the highly detailed wall relief within the tomb of Khnumhotep and Niankhnum (2350 BC). One carpenter smoothes down a wooden surface using an adze, while another polishes a second surface using a grinding/sanding stone. To the left of the character holding the adze, we see a number of other carpentry tools in the background[85].

Another brilliant collection of illustrations emerges from the tomb of Tiy at Saqqara, dating from the Old Kingdom (2500 BC) (Atiya & El-Shahawy 2005: 84). The tomb not only provides us with quite extensive furniture and funerary barge production scenes, it also

[83] Administrative ostraca, dating from the New Kingdom, make regular reference to the management of supplies and work orders from the furniture industry (Leospo 1987: 126).
[84] *Glory of Ancient Egypt* 2002: 698.
[85] *Glory of Ancient Egypt* 2002: 698-699.

provides us with rare examples of log trimming and the positioning of wooden beams on support frames. In addition, the furniture production scene also depicts a tanner stretching a piece of leather over a three-legged support frame. Although this may represent the manufacturing of leather seals, the image does provide some insight into the treatment of leather, a process that may have differed little from the one depicted when it came to the manufacturing of leather cushions, pillows and lashings. Another scene from the tomb depicts carpenters sanding down a seat for two, using sandstone blocks to produce a smooth, polished surface.

From the tomb of Meketra (2000 BC) at Deir el-Bahri, we encounter a detailed model of a carpenter's workshop, complete with miniature craftsmen and a variety of tools including saws, chisels, mallets and adzes, as well as what appears to be a block of sandstone (which would have been used to sand down the finished product). More specifically, the individual working with the chisel and mallet is clearly shaping mortise joints. This is evident not only from the type of tool he is holding, but also from the individual piece of wood he is working (with the joints clearly visible). In addition, two metalworkers are seen reforging the blades of worn-down tools, while a third individual saws through a beam of wood being held up by vertical supports (Burrows 2005: 42).

Image 25: Meketra's model from Deir el-Bahri.

A mural from the tomb of Nebamum and Ipuky (1390 – 1350 BC), presents us with an image of two cabinet makers fashioning a shrine of wood and gold leaf, most likely intended for the royal necropolis. The cooperative skill of joinery is depicted; the young apprentice supports the horizontal slats of the shrine, while the older, clearly more experienced joiner, labours to clean the mortises using a flat-bladed tool[86].

Miniature tools, found separately from workshop models mentioned above, also provide additional insight into the carpentry industry and the importance it held within society. One such example comes from the temple complex of Hatshepsut in Deir el-Bahri. In addition, a collection of both life size and miniature tools was discovered in a 1st Dynasty tomb at Saqqara and included 7 saws, 98 axes and 51 chisels (*Plates 25, 26 & 30*), along with numerous examples of awls, knives and complete items of furniture. The prevalence of these items in the tomb has led to the suggestion that this structure belonged to the superintendent of the royal carpentry works (Leospo 1987: 126).

5.8 CONCLUSION

Within the ancient carpenter's mind, technical prowess was as important as aesthetic appeal, with equal attention being paid to both structural and decorative mastery. With the development of stronger, more accurate tools came the development of superior production methods and techniques.

Intricate joinery saw the light alongside artistic decorative innovations. From pins and nails, to glue, gesso and metal brackets, all these technical innovations would allow the ancient carpenter to focus more directly on the individuality of furniture items, bringing with it the development of truly Egyptian styles and designs.

The use of certain timber species, inlays and decorative materials can provide us with insights into international trade, supply and demand, tradesman skill as well as the social-economical factors influencing furniture ownership. A close study of the inlay materials

[86] *Glory of Ancient Egypt* 2002: 698-699.

themselves can provide detailed information on individual trades, such as gilding, jewellery, glasswork and faience production, which would have profited from a growing furniture market.

An in-depth study of all these interlinked facets of the furniture industry will greatly influence the way in which restoration officials conduct their work. With a better understanding of the finer workings of the furniture industry, these officials will be better equipped to restore excavated items to their former glory, or to create authentic exhibition pieces in perfect imitation of the originals items.

Image 26: Carpentry scene from the mastaba of Tepemankh, Old Kingdom.

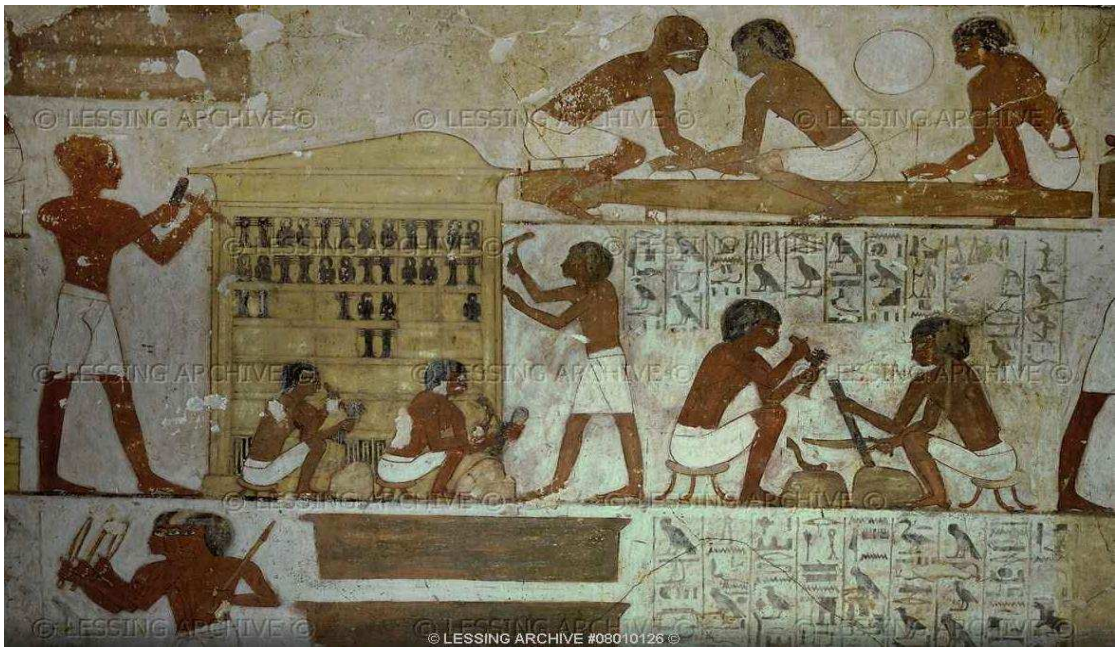

Image 27: Cabinet makers and carpenters from the tomb of Rekhmire, 18th Dynasty.

Image 28: A carpenter working a length of wood. Tomb of Rekhmire, 18th Dynasty.

Image 29: Craftsmen from Nebamum, 18th Dynasty.

CHAPTER 6

STYLES AND DESIGNS

6.1 INTRODUCTION

The furniture of any civilization must reflect its pattern of daily life as well as being regarded as an art form in itself.

Watson 1976: 11

Furniture is a very important part of domestic equipment. It has a dual significance: it is functional, in the sense that it satisfies certain practical requirements; and it is aesthetic, in the sense that it displays a variety of forms and decoration, the characteristic expression of high quality workmanship.

Leospo 1987: 120

Style, referring to the combination of distinctive features of artistic expression, such as size, shape and decoration, thus remains the most insightful area of study when tracing the chronological evolution of furniture. In short, a stylistic analysis, which will be conducted within this chapter, will provide valuable information to our study of ancient furniture. We will follow the development of individual items (beds, chairs, tables, etc), noting the earliest examples and recording the changes particular to the individual item over time. More specifically in this regard, we will start our discussion on style with a look into the evolution of furniture legs. This discussion will be key as furniture legs are found in all items, and represent the most common design element.

When studying furniture legs, the main emphasis falls on the development of bovine and leonine shapes, as well as the utilisation of support cones[87]. Whether or not the bovine

[87] The support cone became a well-known feature within the Archaic Period (Leospo 1987: 129). These cones or drums were common to all thereomorphic legs (Eaton Krauss 2008: 35). It is believed that support cones were first introduced to prevent furniture items from scratching floors made of compacted earth, or those covered in thin layers of stucco or paint (Davis 2000c: 107). Although the cones may themselves have

and leonine styles, along with support cone technology, originated in ancient Egypt cannot be said without a more detailed study into the evolution of styles, the migration of workmen, tools and technologies, and of course the complexities of international trade. Although such a study is beyond the scope of this dissertation, what is certain at this point is that Egyptian styles can be identified based on a stylistic analysis of key attributes. A more detailed study will also allow us to compile a typological sequence for furniture, in other words arranging the pieces in a relative chronology[88].

6.2 THE EVOLUTION OF FURNITURE LEG STYLES: A STYLISTIC COMPARISON

> *...the early craftsman in Egypt naturally found his inspiration in the objects of the world around him.*
>
> Baker 1966: 21

Designs within the furniture industry can be divided into three broad categories: architectonic, thereomorphic (animal-shaped) and anthropomorphic. The first category sees the incorporation of different design elements derived from architecture. The most popular designs include cornices, pylons, vaults and friezes, and in general, these designs are characteristic of boxes, chests and cabinets. The latter category employs animal designs, not only as decorative, but also as functional elements. These designs include bovine, leonine and gazelle shaped legs, as well as duck's head rails and capitals, and are generally used for beds, stools, chairs, thrones and footstools (Leospo 1987: 128-129). Although many scholars place the anthropomorphic category as a somewhat obscure

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scratched surfaces, a reduction in the surface area making contact with the floor would greatly reduce damage. The cones would also serve to protect the delicately carved hoof (Baker 1966: 21). It is possible that this reduction in size is what may have spurred the truncation of cones during the Middle and New Kingdoms (see the later discussion on cone sizes).

[88] Paintings and reliefs supply us with a relatively complete chronological timeframe, yet archaeological evidence and modern research on artefact stylistics still requires an immense amount of work, as they do not yet present us with a homogenous view of the furniture industry (Leospo 1987: 127).

classification between architectonic and thereomorphic, anthropomorphic style is quite distinct, and should fall within its own, individual category[89].

Bovine-shaped legs, introduced during the Early Dynastic time (Baker 1966: 21, Daoud 1996: 84, Fagan 2004: 72), represent the earliest adoption of animal forms into the design of ancient Egyptian furniture. Although the modern observer may attribute this trend solely to aesthetic preferences, a deeper knowledge of Egyptian culture will indicate that mythology and symbolism permeated almost every object, item or image within daily life. The solution to answering the question of 'why' animal shapes were used will thus not be formulated by considerations of aesthetic appeal, but rather by an investigation of the changing cultural circumstances throughout Egypt's history.

During the early parts of Egypt's history, technological and artistic traditions were being formulated that would characterize Egyptian culture (and furniture in particular) for centuries to come. To investigate these traditions, one must look at the prevailing circumstances during the Predynastic, Early Dynastic and Old Kingdom period in general, during which bovine shapes were dominant. It was during this time that Egypt was unified and agricultural success ensured prosperity for all. Domesticated animals played a huge role in this prosperity, with cattle representing the largest and most versatile of these animals. Bulls and cows stood as symbols of fertility (through their production of offspring), while oxen represented strength (as draught animals). Although it is not possible to determine from the items themselves whether these legs belong to bulls or cows, the general consensus is that they are male. This is not because female animals were seen as less important, but rather because male animals are stronger, and that the utilization of bull legs would symbolise greater strength, especially when it came to the structural integrity of furniture items.

[89] Author's note: Despite these categories and their relevant classifications, one must keep in mind that a number of items combined architectonic, thereomorphic and anthropomorphic forms into a holistic unit, incorporating a mixture of complementary elements.

Throughout this time Egypt's attention was mainly focused inwards, and even though the country participated in international trade, the chief priority was local development, and not the expansion of the empire. Once the outside world began encroaching on the Egyptians' personal domain however, the focus began to shift outwards. After the 1st Intermediate Period and the reunification of Egypt by its Middle Kingdom rulers, the idea of 'empire' took hold in the minds of the Pharaohs. Although leonine forms had already appeared during the later parts of the Old Kingdom, it was during this stage of world-view adjustment that the lion became a symbol of royalty, of Pharaonic power[90] and, in short, of empire. Thus, the leonine style soon became the preferred choice, although the bovine form was not completely replaced during the Middle Kingdom. It was only during the New Kingdom that the leonine style truly became dominant over its bovine counterpart.

In short, the function of both bovine and leonine legs appears to have be apotrapaic, in that their primary goal was to ward off evil. The same 'superstitious functionality' is once again encountered in the uraeaus designs on the back of thrones, depicting cobras with raised heads protecting the Pharaoh from behind. Falcon and vulture designs served a similarly protective function, this time providing the ruler with protection from the skies (Eaton-Krauss 2008: 36).

6.2.1 Bovine legs

In general, animal legs (*Plate 44*) from early periods are relatively low in height (Leospo 1987: 129). Our first example comes in the form of a highly detailed bovine leg, which has been dated to the 1st Dynasty and originates from Abydos (Baker 1966: 21, Scott 1965: 130) in northern Egypt. The leg is carved from elephant ivory, which generally tends to appear much whiter than its hippopotamus ivory counterparts (*Plate 44*). What stands out from this design is the clearly defined ankle bones, protruding hock, as well as the bulging

[90] Although the uraeus cobra was more directly associated with the Pharaohs, it would be quite difficult to incorporate a snake-like figure as the design for a furniture leg.

muscles and veins (Blakemore 2006: 16) that emphasise the great strength associated with bulls. To elaborate on this, the two 1st Dynasty legs (*Plate 44*) are further examples of bovine shapes from the Old Kingdom. Here the two holes drilled into the top of the leg are clearly visible. These holes would have allowed the carpenter to strengthen the joint holding the leg to the frame by passing leather straps through the holes and around the side rails of the bed or chair. The concave shape of the leg indicates that the item supported rounded side rails, probably belonging to a bed or stool (Baker 1966: 20-21). In most of the examples discussed in this section, the tenon is clearly visible at the top end of the leg and would have slotted securely within the mortise carved into the frame (or side pole) of the furniture item. In addition, both items present us with examples of legs with distinctively rounded top edges. This rounded edge suggests that the frames to which these legs were attached must themselves have been curved.

When investigating Early Dynastic tradition, not only the remnants of furniture items, but also those from game boards can provide information on stylistic developments. In this regard we have two bovine miniature ivory legs (*Plate 44*) from the 1st Dynasty, originating from the tomb of Den in Abydos[91] (Baker 1966: 20-21). The application of this style to an item outside the furniture industry suggests that the bovine shape was exceptionally popular, at least from Early Dynastic times onwards (Daoud 1996: 84). This idea is supported by the resemblance between the abovementioned leg and the example given by Killen (1994a) of an ivory stool leg from the Tomb of Djer (also in Abydos).

Image 30: The size ration between game board pieces and full-scale versions

[91] http://www.metmuseum.org/works_of_art/collection_database/egyptian_art/furniture_leg_possibly_from_a_game_board/objectview.aspx?page=34&sort=0&sortdir=asc&keyword=&fp=31&dd1=10&dd2=0&vw=1&collID=10&OID=100004091&vT=1&hi=0&ov=0

Another example of an Early Dynastic furniture leg (*Plate 44*) was recovered from one of the tombs at Tarkhan[92]. In contrast to other more fragmentary pieces, this leg boasts an intact and complete tenon. It is clear from this image that the mortise and tenon joints used in this kind of construction had to be reasonably large, perhaps to handle the weight and stress of use. The size of the tenon itself can also give an indication of the dimensions of the side rails or frame into which the leg would have slotted (Baker 1966: 22).

In the case of our next example (*Plate 44*) we are fortunate enough to have a complete set of legs, most probably originating from a low stool. The wood has deteriorated considerably over the ages, yet the main characteristics of the design are still visible. One immediately notes that the support cones are devoid of horizontal bands[93], a feature that was widely employed from very early on. The hooves are painted black, providing a stark contrast to the light colour of the wood. The top edges of the legs are also painted, suggesting that the frame of the stool may have been painted in the same colour. Furthermore, the joints are carved in an I-shaped tenon, while the rectangular holes on the side could have been used to socket in horizontal support bars.

The legs seen in Plate 45 all represent bovine examples (*Plate 45*) from the Old Kingdom and Middle Kingdom (with no specific Dynasties assigned by the museum database), with slight variations between styles. The legs in *Plate 44* all assume the typical style with undecorated split hooves and multi-ringed support cones. In contrast, other bovine legs depict simple cone designs devoid of the multiple rings seen in previous examples, with the only decorations often taking the form of two horizontal bands carved beneath the hoof of the leg. These bands often contain hatching motifs in a herring-bone style (*Plate 45*). Furthermore, the tenon joint of the latter item is rounded instead of square, while two mortise slots are carved on the inside of the leg. This design suggests that the rounded tenon was slotted into the side rail, while the top/bottom rail of the item would have

[92] http://www.digitalegypt.ucl.ac.uk/furniture/earlyegyptfurniture.html

[93] It has been suggested that this banded design, often referred to as ribbing, represented the protective binding wrapped around the bottom of the leg (Eaton-Krauss 2008: 103). This form of binding may originally have functioned as a protective measure against scuff marks on plastered floors.

slotted into the mortises carved into the side of the leg. Upon closer inspection it is difficult to say from the image alone whether the wood is ebony, or whether a cheaper wood was covered with bitumen. The sheen on the wood itself hints that the wood was polished, and that the dark colour may in fact be the actual colour of the wood and not a treatment.

The museum database for the next item (*Plate 45*) does not mention a specific place of origin, nor does it mention an exact date. All that is provided is a relative date of between 2008 and 1075 BC[94], placing it within the Middle or New Kingdom. Once again the tenon joint is clearly visible, along with a single fastening hole to accommodate leather straps. The two dowels visible on the inside of the leg were possibly used to secure a cross beam between the two legs, which would have provided extra stability. The split hooves on the leg differ from previous examples, as the hooves themselves are usually left undecorated. Furthermore, the cone upon which the leg rests is much shorter than the majority of Early Dynastic and Old Kingdom beds, suggesting that there was a general size reduction in support cones towards the Middle and New Kingdoms (see the later discussion on leonine leg cone size).

Another Middle Kingdom example (*Plate 45*) has been described by the museum database as the leg of a chair or couch[95], yet the sloping angle of the leg could suggest otherwise. As we will notice in the discussion on beds, these furniture items tend to slope gently towards the foot side of the construction (Scott 1965: 138-139). While the bed slopes in one direction, the hooves or paws of the legs are facing the opposite direction (towards the head of the individual). The design of this leg thus suggests that it could rather belong to a bed. With regards to style, another observation can be made. Once again the split hoof of the leg is undecorated, which testifies that not all Middle Kingdom legs now adopted a decorated hoof. Furthermore, the support cone is not ringed, which indicates that ringed cones were not a set decorative technique employed in all instances.

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[94] http://www.brooklynmuseum.org/opencollection/objects/117094/Pair_of_Chair_Legs
[95] http://www.brooklynmuseum.org/opencollection/objects/116781/Pair_of_Animal_Legs_From_a_Chair_of_Couch

As with decorated hooves, not all items of furniture possessed animal shaped legs (*Plate 46*). The two examples depicted here originate from Lahun[96] (Kahum) near the entrance to the Fayyum, and have been dated to the late Middle Kingdom. The legs take a simple square shape, with the first adopting a primitive hoof-like support cone, while the second simply retains the square shape throughout the length of the piece. Although the majority of chairs, stools and beds utilise animal shaped legs, boxes and chests in general make use of simple square legs. This is perhaps because boxes and chests were built lower to the ground, leaving very little space for the incorporation of decorative legs. Also, from an aesthetic point of view, the box lid along with its front, back and side panels would have provided the preferred focal point on which to include decorative motifs. In simple terms, if the legs remain plain, the attention will be drawn to the decorated box.

6.2.2 Leonine legs

The origin of the leonine leg can be traced back as far as the 3rd Dynasty (Eaton-Krauss 2008: 35). By the 4th Dynasty (*Plate 47*) these thereomorphic forms were well known and grew in popularity as time progressed. The chair of Queen Hetepheres (Fagan 2004: 72, Reisner 1929: 85) presents us with one of the earliest examples of leonine style. The legs are simple and plated in gold, with the characteristic lion claws and support cones clearly visible. The support cones in this instance boast multiple horizontal bands, a feature which is later replaced by a preference for fewer bands. The cone is roughly the same width as the paw, another element which gradually reduces in size over time. In addition, an example from the 6th Dynasty tomb of Mereruka at Saqqara clearly depicts the vizier seated next to his wife upon a bed resting on lion-shaped legs. Both examples support the use of leonine legs during the earlier periods of Egypt's history, yet despite the frequent use of leonine features at this time, the design only became dominant during the Middle and New Kingdoms (Manuelian 1985: 103). A relief from the tomb of Amenemhat and his family

[96] http://www.digitalegypt.ucl.ac.uk/lahun/town/furniture.html

clearly illustrates the leonine shaped legs employed in the design of a simple couch. This artwork is dated to the 11th Dynasty[97], and similar scenes from tomb art of this period support the theory that leonine legs became increasingly popular as the Middle Kingdom[98] progressed. One artefact presents us with a perfect example of such a leg, and may have originated from the later part of the Middle Kingdom (or even the 2nd Intermediate Period), as the support cone is already displaying the truncation more characteristic of the New Kingdom.

Although Manuelian (1985) states that the New Kingdom experienced a 'universal replacement' of bovine legs with more ornate leonine legs, examples of bull's legs from this period indicate that the bovine shape was still in use, even though it had a diminished popularity. Moreover, when we look at Nubian furniture legs (*Plate 49*) from around 1700-1500 (*Plate 18*), it appears as though Egypt's neighbours preferred the more traditional bovine styles[99], in effect keeping age old Pharaonic traditions alive. Some Middle to New Kingdom characteristics are in fact visible on these bovine examples, as the legs are more slender, less curved and also less muscular than Old Kingdom Examples.

As we redirect our focus on items from the New Kingdom, we notice slight but important changes, especially with regard to the establishment of typological sequences. The first example (*Plate 49*) from this period takes the form of a modest leonine leg found at the site of Medinet Gurob (Ghurab) near the entrance to the Fayyum[100]. The leg is very simple in its design and is quite slender for its length. The leonine paw rests on a support cone with four broad rings, which marks the transition to fewer horizontal bands. Furthermore, the support cone remains roughly the same dimension as the paw itself, suggesting that this item may be located within the earlier parts of the New Kingdom, or at

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[97] http://www.globalegyptianmuseum.org/record.aspx?id=15268

[98] Not only lion but also slender gazelle legs began to replace the traditional bovine form (Fagan 2004: 73, Killen 1980).

[99] With trade booming between the two neighbours it is possible that some of the bovine styled furniture, dating to the New Kingdom, may in fact have been produced in Nubia. This may lead us to believe that certain furniture styles were in fact regional styles during the New Kingdom.

[100] http://www.digitalegypt.ucl.ac.uk/gurob/town/finds.html

least some time before the narrowed design of support cones became dominant. A similar New Kingdom example is depicted in *Plate 49* next to the Medinet Gurob leg.

From further afield, legs originating from the New Kingdom site of Mergissa in Upper Nubia[101], are described by the museum database as possible chest legs (*Plate 49*). Yet, as mentioned above, chests and boxes are rarely supported by animal shaped legs, as they are usually supported by simple square or rectangular legs. It could be more accurate to suggest that the legs belonged to a stool or low chair. The tenons on the upper part of the leg include drilled holes, suggesting that the joint itself was strengthened through the use of wooden dowels. Holes are also seen at mid-height and may have housed support struts to keep the legs from buckling.

The place of origin for the last image of *Plate 49* is not stated by the museum database, but it does mention that it dates from the New Kingdom[102]. The four ancient legs of this stool were recovered, and attached to a modern seat (the colour of the seat is visibly different from the painted ancient legs). The lion paws are carefully crafted to highlight the toes and nails of the lion, while the top half of the leg is squared-off to allow for a flush alignment with the seat. Here we see a clear example of the narrowing tendency of support cones[103] mentioned above. The cone is divided into five horizontal bands/rings, of which the fifth and topmost band widens to make contact with the paw. The bottom part of the cone making contact with the ground is thus non-parallel to the width of the paw; a feature known as truncation. The same design feature is noticeable in a white-washed 18th Dynasty[104] leg.

Besides the adoption of leonine legs, and the use of truncated cones, the ancient Egyptian carpenter also became familiar with the use of lion-headed capitals[105]. Textual references from the 6th Dynasty, referring to “a shining throne with lion’s heads”, suggests that leonine capitals were already in use during the time of Pepy I. A relief carving from the

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[101] http://www.globalegyptianmuseum.org/record.aspx?id=6049
[102] http://www.globalegyptianmuseum.org/record.aspx?id=10007
[103] Upon further investigation, it appears that the adoption of truncated cones was already practiced during the Middle Kingdom, but that the design only supplanted wider cones during the New Kingdom. See the discussion on *Plate 67*.
[104] http://www.gustavianum.uu.se/vm/vmdb/vmdb.php?lang=en&act=view&post=2
[105] These capitals are also known as protomes (Eaton-Krauss 2008: 36).

12th dynasty sarcophagus of Aashyet (Ashait) also indicates that this style was already well known by the Middle Kingdom (Scott 1965: 143). In this regard our best example comes in the form of a broken lion's head[106] (*Plate 50*) from the Memphite region, which has been assigned to the 12/13th Dynasty. Yet, despite its application during this time, Scott (1965) suggests that lion-headed capitals did not become widely popular until the 18th dynasty.

From a technical point of view, it appears as though these capitals were at first carved separately from the leg itself and incorporated as a decorative element without any practical function. This solely decorative feature is also encountered in an ebony chair from the New Kingdom (the dynasty is unspecified by the museum database). Here, the head is once again carved separately from the leg itself, but the idea behind the design is quite clear; the side poles form the torso of the lion, thus interlinking the front and hind legs, subsequently forming a complete leonine body, with the lion's head featuring as the focal point. This design characteristic would later be modified, as the head would either be carved along with the leg, or along with the torso (side pole) of the lion to form one solid piece.

In this regard, one carved item stands as our foremost example of the new "full-bodied" style (*Plate 50*), representing an improvement on the new design, which is both technically and aesthetically superior to the one discussed above. This 45cm tall lion-shaped leg from the New Kingdom[107] also presents us with the new double leg style that became highly fashionable during the 18th Dynasty, especially in the case of funerary beds. From a manufacturing point of view, the legs, head and portion of the torso are all carved from a solid piece of wood, presenting a sturdier construction than the ebony chair from the New Kingdom. No joints or dowel holes are visible from either angle, suggesting that the joinery would have been incorporated into the front part of the torso (behind the lion's shoulders). In cases where dual legs are used, both paws would be supported by a single support cone, this time in an oblong instead of conical shape.

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[106] *Plate 50:* A selection of leonine legs and lion-headed capitals/end rails. Also included is an example of a relief carving depicting the discussed style (from the Middle Kingdom tomb of Princess Ashait).
[107] http://www.royalathena.com/PAGES/EgyptianCatalog/Misc/BLR201.html

The three funerary beds from the tomb of Tutankhamun [108] represent a continuation of this now popular, 'full-bodied' leg style (*Plate 50*). As is the case with the ebony chair mentioned above, both front legs of the animals conjoin to form a single furniture leg. When observing the middle and left examples, it appears as though the torso and head of the animal formed the side pole, while the leg of the animal formed the leg of the bed. The joint, in this case, would then be below the head of the animal, with the legs affixed to the side poles at a similar position to the earlier 'single leg' constructions. In general, although the design was popular during the 18th dynasty, it did not completely replace the single leg version of earlier styles, and both continued to flourish throughout the New Kingdom. Furthermore, the construction differs in another facet of design, as the cones are replaced by a rectangular wooden frame, upon which the paws rest directly. This frame design appears to be limited to funerary beds, as the sleeping beds from the same tomb remain supported by individual cones (Desroches-Noblecourt 1972: XXVI & XXVII).

Although the focus of this dissertation falls upon a chronology stretching from the Early Dynastic Period until the end of the New Kingdom, a stylistic analysis of furniture styles has to include examples from later periods to allow for a comparative study. In this case, an examination of two Roman Period legs (*Plate 50*) is appropriate. The legs, belonging to a funerary bed[109], show specific design characteristics that markedly separate its style from those belonging to earlier periods. Firstly, the lion faces clearly show Graeco-Roman influences, with large round eyes resembling those encountered on mummy portraits from the same period. Secondly, the mosaic design, consisting of diagonal rows of black, white and red blocks, is also a characteristic not encountered in the New Kingdom. Although the museum database does not mention the material used to create the mosaic design, it appears as though the blocks are painted on the stuccoed[110] surface. Thirdly, and

[108] http://www.globalegyptianmuseum.org/record.aspx?id=15139
[109] http://www.globalegyptianmuseum.org/record.aspx?id=3484
[110] Heavy stuccoed surfaces are also characteristic of the Graeco-Roman Period and may have a simple, environmental explanation for its application. As discussed on the section on sustainable agriculture, wood resources were severely reduced by the Graeco-Roman Period. This would have given rise to more regular use of inferior quality woods, which would have required significant amounts of stucco to cover imperfections.

perhaps the most recognisable, are the square supports upon which the legs rest. The design takes the overall style into a decorative realm that is clearly distinguishable from earlier periods. Not only are these supports now square, as opposed to the typical cylindrical shape encountered during earlier periods, but they are also proportionally larger when compared to the length of the leg itself. The support cones (or squares in this instance) occupy almost 25% of the total length of the leg, while earlier examples[111] from lion legs only occupy an average of between 12-20%, with some of the smallest cones only occupying 8%. Although these painted versions may be more characteristic of the Roman Period, similar un-stuccoed versions made their appearance during the later part of the New Kingdom.

Image 31: Stylised leonine bed legs, New Kingdom

The entire body of the lion could also be incorporated into the leg of the chair, as seen in *Image 32* (Baker 1966: 138). The lion is sitting in an upright position with straight front paws and a slightly curved back. The animal is seated on a square block with straight sides, representing a differentiation from that of the cavetto corniced Graeco-Roman legs. This stylistic difference, along with the more realistic lion features, may indicate that this item dates from the late New Kingdom.

[111] This comparison was based on the measurement and examination of artefacts in my image database.

Image 32: Stool leg carved in the image of a seated lion, New Kingdom

Image 33: A stool boasting the full-bodied lion style, 26th Dynasty

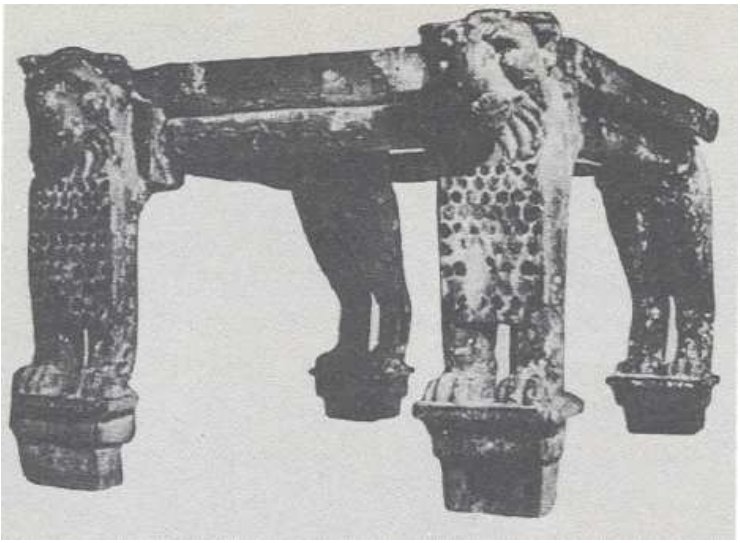

Image 34: A stool incorporating the full bodied style. The design of these lions are typical of the Late Period

In order to be fully aware of true Egyptian style, we also have to take a comparative look at styles from elsewhere. This will sharpen our skill in distinguishing between furniture from in and around the Ancient Near East. For the purpose of this brief discussion, we will examine an example originating from either Greece or Italy (*Plate 50*) (the museum database is unclear about the exact origins[112]), which have been dated to between 100 BC and AD 100. Although the style may follow in the footsteps of Egyptian leonine shapes, certain design characteristics are visibly different. In this case the body of the lion is incorporated into the structure of the leg itself, and neither the head, shoulders nor torso of the lion play a functional role in joining the leg onto the frame of the table. Furthermore, the characteristic support cone of Egyptian (or Egyptian styled) furniture legs is missing.

In conclusion it is evident that a relative chronology for the evolution of ancient Egyptian furniture can be compiled through an analysis of stylistic variations over time. The ultimate goal would be to acquire enough data of surviving furniture legs, including information on size, design proportions and materials, in order to establish a relative date for an item based on the visible characteristics of the legs alone. Stylistic analyses can serve as a non-destructive form of age determination in cases where the procurement of physical samples for scientific methods may not be viable.

6.3 FURNITURE ITEMS

When reviewing the almost 2400 year development of ancient Egyptian furniture, one must keep in mind that the examples discussed cannot possibly represent all styles and designs within the ancient carpenter's repertoire. The examples mentioned below are but a few, and mainly represent those items preserved in the safe cavities of royal tombs. The utilitarian wares of everyday people suffered a less fortunate fate; being passed down from generation to generation, worn down from use and eventually discarded, these wares rarely

[112] http://www.fitzmuseum.cam.ac.uk/opac/search/cataloguedetail.html?&priref=65544&_function_=xslt&_limit_=10

survived the millennia intact. This said, although we do not possess the full spectrum of wares, one can still make an educated guess in assuming that certain day to day items (possessed by commoners) served similar functions to those intended for royal use. Certain technical differences are of course obvious, such as the choice of material, over-all quality and longevity, but the function would have remained the same. For example, a bed remains a bed and is intended for sleep, irrespective of its physical appearance. Similarly, a folding chair remains a folding chair, whether it serves Pharaoh en-route during one of his campaigns, or whether it simply seats a humble stone mason working in a quarry.

While function remains constant, style, material composition, and technical design vary significantly. Not only do these elements vary between social classes, but they also vary chronologically. These variations occur not only because of changing times, fashions or the influx of international influences, but they also vary because of natural, economic, social, political and religious changes, such as increased or reduced access to natural resources, plummeting or climaxing trade relations, war and climatic phenomena. This can be illustrated by the use of glass or faience as a substitute for semi-precious stone inlays did not occur because of changing fashion trends, but rather occurred due to a shortage of precious stones, and/or an economic need to supply cheaper substitutes for use in decorative designs. The same can be said regarding the use of hippopotamus ivory, which was substituted in times when elephant ivory imports from Nubia were at a low, or when cheaper variants needed to be manufactured for members of lower social strata.

6.3.1 Beds (Old Kingdom)

One of mankind’s first and most primal concerns would have been the procurement of a safe (and comfortable) resting place. Although we have relatively few examples of beds prior to the unification of the two lands, examples from the Early Dynastic Period are plentiful (if not from the archaeological record, at least from visual representations). The

earliest beds took the form of simple piles of soft plant material, which would later be replaced by woven mats. These mats represent some of the earliest and most basic beds, yet remained in use throughout much of ancient Egypt's history. In fact, as with tables, beds remained luxury items that were not seen as necessities by those who chose to spend their hard earned money on more useful and important items[113]. The majority of people slept on the floor, with animal skins representing an alternative to reed matting. In some cases people would use rolled up bundles of clothing to support their heads (Leospo 1987: 128), while others would opt for wooden headrests. Our earliest examples of bedding and furniture originate from the Tarkhan[114] cemeteries (Baker 1966: 19), and have been dated to around 3000BC. As mentioned above, these mats remained in use throughout Egypt's history, with examples dating to the Middle and New Kingdoms (*Plate 51*).

Some of the earliest examples of beds, that begin to resemble our own, originate from Predynastic times in the Nile valley. Wooden poles would be laid down parallel to the intended position of the body, with adjoining poles at the position of the head and feet. Cross poles made of reeds or thin wooden struts would then be placed between the side poles to support reed mats or plant fibre matting. The frame and base would then be placed upon simple legs (often carved in animal shape). As a whole the construction formed a very simple rectangular bed that was quite low to the ground (Manuelian 1985: 105). Such items would have been encountered in the homes of both middle and upper class members of society (Killen 1994a: 28)

It appears as though no formal system[115] of jointing was used, as no such examples from this period have survived in the archaeological record. However, to shed some light on the origins of bed joinery, later examples from the 1st Dynasty show that intricate methods were employed to fasten bedding to wooden frames. One example of such a method comes

[113] Models in tombs indicate that houses were furnished sparingly during Old and Middle Kingdom times, and that most items common during the New Kingdom were seen as luxuries in earlier periods (Leospo 1987: 127).
[114] http://www.globalegyptianmuseum.org/record.aspx?id=2548
[115] With this 'formal system' we refer to a functionally related group of elements, in our case specific wooden joints that would be seen as common of this particular time period.

from the cemetery of Tarkhan[116], discovered by Flinders Petrie in 1913. In this instance, leather lashings and woven plant fibres were passed though slots that were cut into the wooden frame of the bed (*Plate 52*) (Baker 1966: 24). These lashings or ropes would then be plaited to ensure flexibility and increased strength (Killen 1980: 23-24). In a similar fashion, two examples from Gebelein[117] in Upper Egypt point out that the typical style of Early dynastic beds incorporated not only intricately woven bases but also papyrus flower capitals or '*umbels*' (Manuelian 1985: 103) at both ends of the side rails. Furthermore, in order to ensure that the woven matting did not become detached from the frame under the weight of the user, broad leather straps were secured underneath the matting to provide support. Besides the innovations in technical design, many of which endured to the New Kingdom, it was also during this time that bovine-shaped legs became widely used in the furniture industry. Both bovine and stylized papyrus/lotus flower terminals thus became common decorative elements during the Old Kingdom (Baker 1966: 21, Leospo 1987: 129).

Image 35: Leather straps

Bed frames in general were constructed in a simple rectangular design, which would more often than not slope from the head towards the feet. Besides the 3rd Dynasty example from the tomb of Hesy-Re, one of the earliest examples of this slope comes from the 4th Dynasty tomb of Metjen, where a wall painting depicts a workman carrying a bed over his shoulder (Brovarski 1996: 130). Traditionally, the frame was affixed to the legs using combinations of mortise, tenon and cross-halving joints, with matting attached to the frame using a similar

[116] http://www.globalegyptianmuseum.org/record.aspx?id=5202
[117] http://www.metmuseum.org/works_of_art/collection_database/egyptian_art/bier/objectview.aspx?page=3&sort=0&sortdir=asc&keyword=&fp=1&dd1=10&dd2=0&vw=1&collID=10&OID=100008932&vT=1&hi=0&ov=0

method as explained above. Also, lashings would often be used to strengthen the joints, and the technique was already regularly employed by the Middle Kingdom[118]. The process entails tying wet lashings around the joint and feeding them through twin holes drilled into the top half of the legs. The leather would then be allowed to dry, thus shrinking around the wood, creating a tight hold (Baker 1966: 22, Blakemore 2006: 14). The two round holes, which would have accommodated the lashings, have been observed in numerous examples of furniture legs, including those documented in *Plates 44 and 45*. It appears as though this technique may have been replaced during later periods (especially during the New Kingdom) as stronger joinery methods, combined with the use of dowels, nails, metal brackets and strong glue, would have supplanted the use of leather lashings[119] (Oates 1981: 15).

Furthermore, it is clear from some examples that leather coverings or sheathes were used to cover side poles. These coverings would most likely have been attached to the underlying wooden poles using animal glues or resinous materials. More extravagant examples boast copper or gold sheathing, which would have been attached to the frame using tiny metal pins (Killen 1980: 24-26). Variant forms of metal sheeting could also be used to strengthen jointed sections of furniture, such as the sections attaching the leg of the item to the side and frontal/back poles. An example of this technique comes from the tomb of Rekhmire, dated to the 18th Dynasty, and displays a stylized lion-headed sheathing securing the joint area (James 1984: 205), as seen in *Image 36*. Although some would categorise the lion-headed beds as funerary items, these beds were in fact designed for daily use, as they are often depicted in tomb art with bedding (Brovarksi 1996: 132-133). Such beds were already available during the Old Kingdom, and are depicted on the tomb walls of Heliopolis from the 6th Dynasty (Brovarski 1996: 131).

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[118] http://www.globalegyptianmuseum.org/record.aspx?id=7090

[119] Personal observation: Few examples of leather bound joints are visible from the artworks of later periods. Also, fewer examples of furniture legs boasting lashing holes towards the top of the leg are observed, suggesting that this technique may have been replaced, at least in more expensive versions of furniture items, where the client could afford the application of glues, metals pins and corner brackets.

Image 36: Carpenters working on a bed. Tomb of Rekhmire, 18th Dynasty.

Although few physical examples of beds and other items of furniture have remained intact from this period, detailed wall reliefs from tombs provide us with some common proportional and design guidelines. The best of these examples originate from the 3rd Dynasty tomb of Hesy-Re at Saqqara (Killen 2001: 580). Wall paintings[120] from this tomb clearly illustrate the various structural and design elements characteristic of the Old Kingdom, along with the wide range of furniture types featuring within the carpenter's repertoire. In one specific panel, no less than eight beds are visually represented, each one drawn to highlight specific characteristics. *Image 37* represents four of the eight beds from this panel.

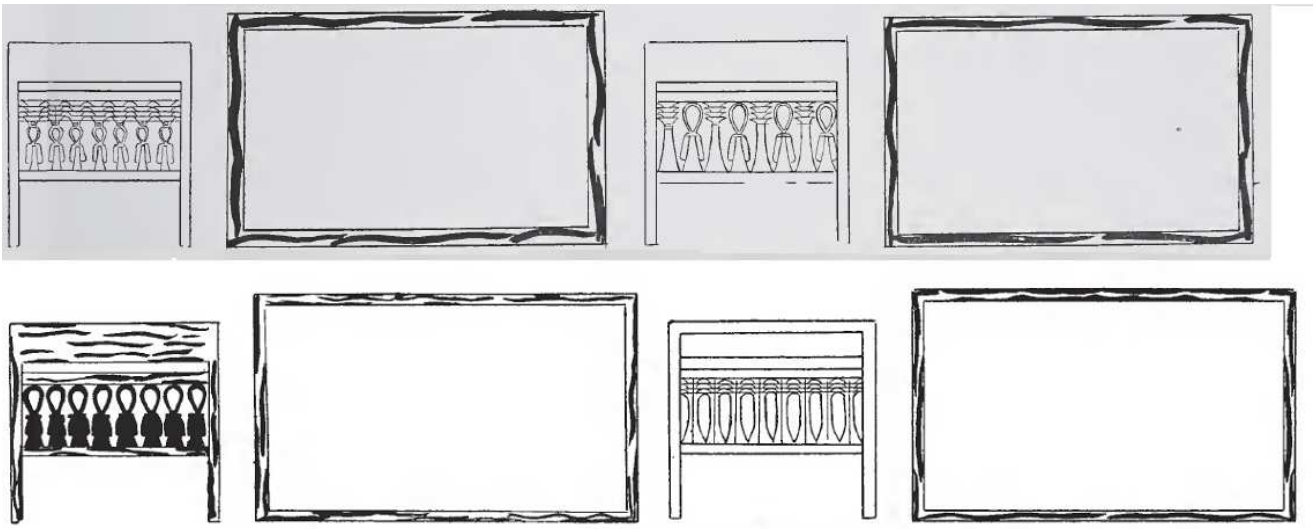

***Image 37*:** Four beds from the tomb of Hesy-re, seen from a bird's eye and side view.

[120] The items from this inventory list are drawn from unique angles, incorporating not only profile, but also frontal and overhead views into one image. This orthogonal method of illustration allows for exceptional detail that would not be visible through traditional views (Leospo 1987: 133)

Bovine and papyrus flower designs, along with basic structural features, such as sloping frames (Quibell 1913: 6, Scott 1965: 138-139) and the use of straps to strengthen joints are drawn in detail.

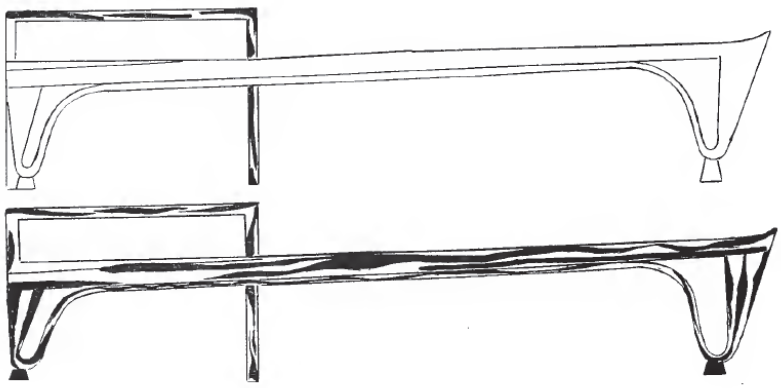

Image 38: Sloping bed frames

The paintings are so well illustrated that we can even identify leather thongs, used in a similar fashion to modern trampoline springs[121] in order to attach woven mattresses to bed frames (Scott 1965: 139) (*Image 39*). The artists also made specific reference to the wood graining[122] (Manuelian 1985: 103-104) by applying colour variations in their work. In short, the paintings are key to our understanding of the technological and design advancements made during the Old Kingdom (Baker 1966: 37, Brovarski 1996: 123, Killen 1994a: 28, Oates 1981: 13, Scott 1965: 135, Quibell 1913: 2).

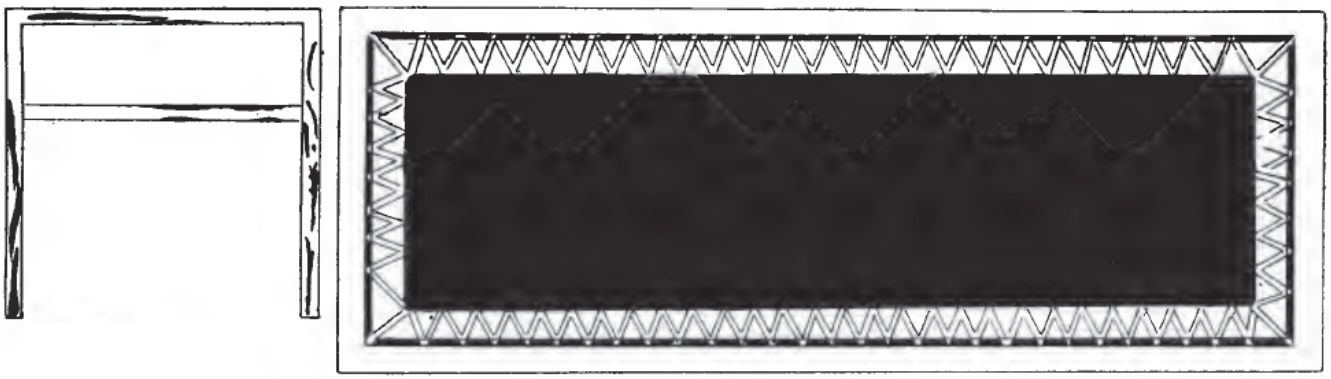

Image 39: Clearly illustrated wood grain and support springs

[121] These leather springs were later replaced by interlaced cords (Scott 1965: 139) that would have provided extra strength and flexibility.

[122] It is possible that specific colour differentiations could indicate specific wood types. This would have been an important detail for reliefs and paintings, as the quality and type of wood would have conveyed messages of affluence and power (especially if the wood type was imported).

Beds with planks are also depicted, confirming that solid base designs continued to be used as alternatives to the woven base designs that later became dominant. To add to this, we can also identify the use of a footboard or 'footbox', which would have been placed on the foot end of the structure in order to prevent bedding from slipping off the angled bed (Dunham 1941: 10, Killen 2001: 580, Quibell 1913: 6-7). Upon closer investigation, one will find that the earlier boards or boxes rested on a separate pair of legs (*Image 40*), ones which did not help to support the weight of the bed frame.

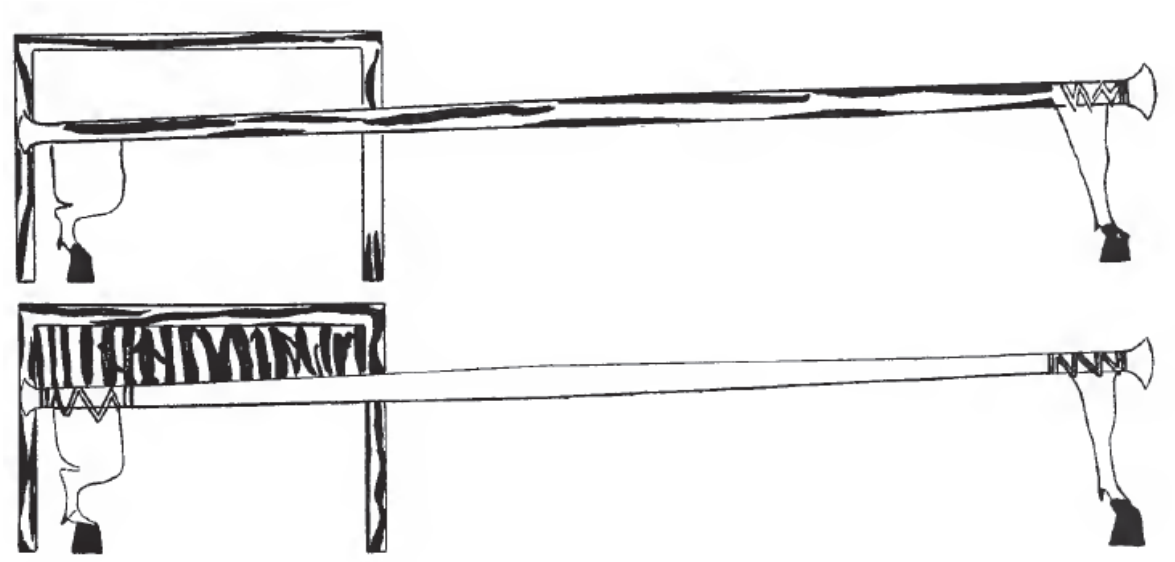

Image 40: Beds depicted as possessing footboxes

It was only during the 4th Dynasty that footboards were finally incorporated into the frame of the bed itself (Killen 1980: 28). A perfect example of this trend is represented in the beds of Queen Hetepheres (*Plate 53*), dating to the 4th Dynasty (Baker 1966: 47, Brovarski 1996: 131, Fagan 2004: 72, Killen 1980: 59-61, Oates 1981: 13, Reisner 1929: 88).

6.3.2 Beds (Middle Kingdom)

When discussing Middle Kingdom (and in fact, New Kingdom) furniture, one must remember that most of the conventions around art and furniture were formulated during the

Old Kingdom, and that the majority of these elements remained highly influential during much of Egypt's history. The unification of the land and the centralisation of power, for example, encouraged the crafting of furniture that was exceptionally large and bold (Manuelian 1985: 103-104), in essence representing a physical manifestation of the grandeur of the Kingdom.

When later changes are in fact observed, these are mainly the result of technological innovations and the increased availability of raw materials[123]. Specific stylistic changes, such as those observed in the evolution from bovine to leonine legs, can be linked to socio-cultural developments and changes in ideology, but the core identity[124] of Egyptian furniture remained fundamentally unchanged. We see, for example, the following changes taking (an almost) temporary effect during this period:

During the 11th Dynasty furniture became more modest in design, yet still retained its royal beauty. We see the popular use of straight legs, which would be rounded off towards the top, while left square towards the bottom. These 'plain' legs did not replace animal shaped legs, but rather functioned as design alternatives[125] (*Plate 46*). Along with this 'simplification' of design, bedsteads generally increased in size[126]. In this regard, the 12th Dynasty presents us with some of the largest examples of beds encountered thus far, despite the general Middle Kingdom tendency to move away from weighty forms. A wooden bed from Kerma in Nubia (Sudan) not only provides us with a representation of increased size, but also presents wonderful examples of the employment of dowels as joint supports, as well as the use of brackets to affix certain segments of the item: in this case the

[123] With regards to raw material we must also keep in mind that a decreased availability can also lead to stylistic changes, as was the case with turquoise and the development of faience and glass technologies.

[124] Major similarities in form strengthened this core identity, with variations in quality and decoration signifying the major differentiating elements between royal and common furniture. In addition, the practical necessities and requirements of furniture remained basically unchanged throughout time, thus ensuring a continuity of traditional designs. Moreover, the conservative attitudes of artisans and their strong traditionalism would also have preserved core stylistic attributes over time. The most noteworthy changes would have been on the fronts of decoration, and not functional and/or structural form (Leospo 1987: 127-128).

[125] Author's note: These 'stylistic alternatives' once again support the notion that the core identity of Egyptian furniture was not altered dramatically.

[126] Author's note: The second development can have multiple causes. It can perhaps be seen as indicative of the greater availability of wood resources within Egypt via international trade connections. It can also be that size denotes affluence, and that larger items simply reflected a tendency of socio-economic expression as brought about by the developing middle class. Finally, the increase in size could be connected with Egypt's self image as a growing power within the international community.

footboard of the bed (Baker 1966: 144, Killen 1980: 30-31). The reproduced exemplar from the Museum of Fine Arts in Boston boasts the raw hide lacing and ivory inlays[127] (*Plate 45*) that would have adorned the original (Dunham 1941: 7-8).

As is the case with tomb paintings, model furniture also provides us with valuable information. One such example comes from the tomb of Sitrennut, Hawara, which has provided us with details on changing design types and technologies in use from the 12th Dynasty onwards. The model (*Plate 55*), measuring 490mm by 237mm, includes small-scale, yet incredibly detailed, stub mortises and tenons, dowels and leather thongs (Killen 1980: 30), as well as the remnants of a single leather support strap. The model also boasts lion-shaped legs, indicated that leonine styles were popular during the Middle Kingdom, frequently featuring alongside bovine styles. What makes this model unique is the directional positioning of the legs. Where earlier styles have the paws of the legs pointing in the same direction (towards the head of the bed and in the opposite direction of the angled slope of the bed), this example depicts the paws as pointing inwards (towards each other). This stylistic deviation seems to have been a Middle Kingdom occurrence, as indicated by a wall painting from the 11th dynasty (*Plate 48*). From my personal observations I have not yet encountered similar examples of inward facing furniture legs post-12th dynasty.

During this time Kerma was a centre of production and delivered numerous items, including bronze daggers, faience items and furniture decorated with a unique combination of ivory and mica inlays (Hafsaas-Tsakos 2009: 66). It would seem then that the use of mica for furniture inlays was not an original Egyptian tradition, and could thus serve as a marker for distinguishing between locally produced and Meroitic produced furniture[128].

At this stage, we cannot really deliberate upon the subject of Middle Kingdom beds much further, as there appears to have been no drastic stylistic changes during the progression from the Old to New Kingdom. This not only pertains to beds, but also to

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[127] According to Manuelian (1985) the mythical beasts depicted on the footboard are unknown to Egypt, yet upon closer investigation it turns out to be the god Tawaret bordered by oryxes and what appears to be jackals or hyena (*Plate 42*). These inlays were recovered in close proximity to the bed (Baker 1966: 144).

[128] Although I could not locate an example of one of these items for visual reference, I did locate an example of a mica inlay tile (*Plate 39*) from the Petrie collection, originating from the Meroitic Period (800 – 350 BC).

furniture in general, as the Middle Kingdom saw little artistic expression that would have resulted in a drastic change from Old Kingdom styles.

6.3.3 Beds (New Kingdom)

Needless to say, with the influx of foreign goods and the empire reaching the height of its power and influence, the New Kingdom presents us with some of the finest examples of ancient Egyptian furniture. Techniques and tools were honed over the centuries, and trade secrets were passed down from generation to generation. Most, if not all, of the desired materials were available and no expense was spared when it came to the manufacturing of royal furniture.

Although furniture retained many of the core characteristics developed over the centuries, some marked changes can be observed. Besides the wide scale adoption of lion's legs, beds also lost their characteristic downwards slant (Dunham 1941: 10). Instead of the rigid, straight downward slope of earlier examples, beds from the New Kingdom now had rounded (concave) curves designed into the frame itself. This meant that the slight elevation of the head now relied on the curvature of the frame instead of the high differentiation between the front and the hind legs. This structural feature is clearly visible in Tutankhamun's beds (*Plates 57-58*). Although the beds lost their downward slant, and bed users no longer feared sliding off their beds, the footboard had become a traditional characteristic of Egyptian beds and would therefore be retained as a decorative element (Scott 1965: 139).

Another change came about with the shortening of side poles. Not only did this shortening result in a more 'squared-off' rectangular shape for bed frames, it also led to a reduced incorporation of papyrus umbels in bed designs. Straight, undecorated legs were also popular during the New Kingdom (Manuelian 1985: 114), a trend which originally

developed some time during the 11th Dynasty[129] of the Middle Kingdom (Killen 1980: 31) and continued well into the Roman Period. Our best example of such a bed from the New Kingdom comes from Deir el-Medineh (*Image 41*). Numerous individual bed legs have also been recovered, some of which boast a 'turned' appearance[130] (*Plate 56*).

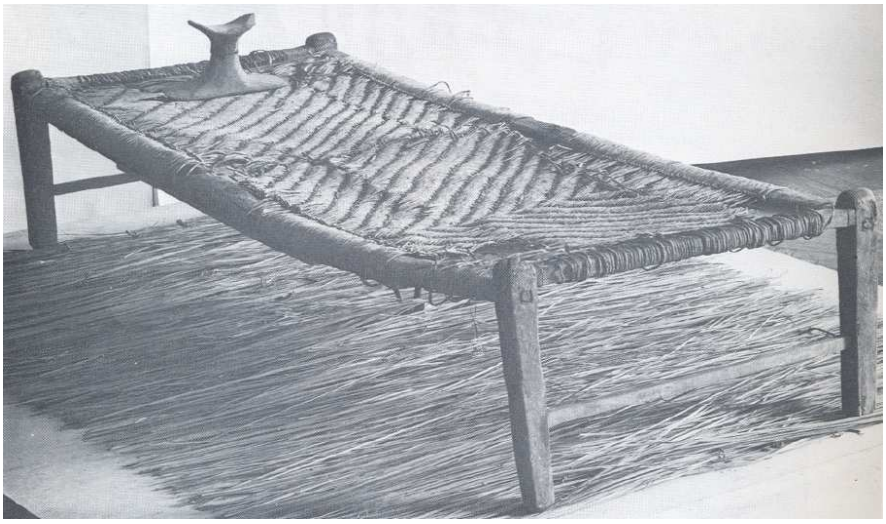

Image 41: Bed from Deir el-Medineh, New Kingdom

The tomb of Yuya[131] and Tuya also provides us with some wonderful examples of craftsmanship and will therefore be used as an introduction to New Kingdom styles. The items not only represent changing technological and decorative elements, but also reflect the range of economic diversity within the furniture industry (Manuelian 1985: 103).

Although the beds recovered from the tomb of Yuya and Tuya are in fact funerary beds, and not intended for the living to sleep on, they still represent examples relevant to our study. The beds assume typical shapes, with a rectangular frame supported by two longitudinal and six traverse support bars. These bars are fastened to the frame of the bed using simple, yet effective, wooden pins. The mattress consists of a reed mat, enveloped by a double layer of linen, which would often be folded and tied in place (Scott 1965: 139). Upon the linen we encounter a drawing in ink outlining the figure of Osiris (Davis 2000a: 46). This apparent simplicity is most probably a continuation of the simplified design adopted during the Middle Kingdom.

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[129] Refer once again to the discussion on legs and *Plates 13 and 14.*
[130] These legs are referred to by Eaton-Krauss (2008) as flared legs.
[131] Also spelled as Yuia (Iouiya) and Thuiu (Touiyou).

Moreover, the same can be said for the beds encountered within the tomb of Tutankhamun . While styles were more simplified in their physical design, the decorative side of style did not assume a ‘back seat’ position. In fact, despite the simplistic physical designs of furniture, decorative elements excelled, evolving into some of the finest examples encountered throughout Egypt’s history.

The royal bedstead of Tutankhamun (*Image 42*) is one of the more modest beds discovered in the lavish tomb, and roughly follows the examples found at Kerma (Killen 1980: 31). As mentioned previously, the frame of the bed delivers the desired angle for the head by forming a slight concave shape in the base itself. The footboard is by far the most modest from the collection, and simply boasts a combination of horizontal and vertical slats incorporated into a three-sectioned design. The sections are divided by stylised papyrus flowers (forming a simple vertical band), a feature that repeats itself within the other examples. The leonine legs are clearly visible and point in the same direction (towards the head side of the bed), while the entire structure is coated with a layer of white paint (Baker 1966: 105).

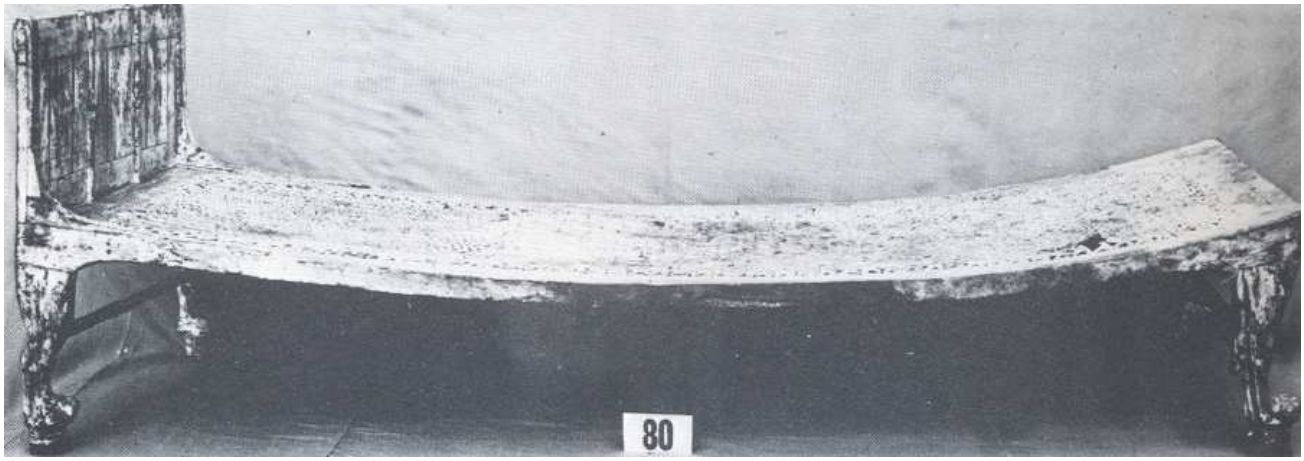

Image 42: The royal bedstead of Tutankhamun , 18th Dynasty

The ebony bedstead (*Plate 57*) of the Boy King is structurally similar to the example discussed above (Killen 1980: 32), but in this case the wood is left in its natural state as to highlight the dark, rich colour of the wood. The white matting and ivory inlays are

accompanied by gold sheeting (found on the support cones and foot-board decorations) and provide a stark contrast to the chocolate backdrop of the wood. The three-sectioned footboard boasts cut-out motifs of the god Bes, accompanied by pouncing lions on both sides. As with all the examples from the tomb, the footboard is secured to the base by aid of corner brackets (Baker 1966: 103-104).

The golden bed (*Plate 58*) recovered from the tomb is a fine example of Egyptian workmanship. The entire bed (except for the woven base) is covered in a gold sheeting of between 3.5 mm to 4.0 mm thickness, which is held in place by a combination of glue and domed[132] metal tacks (Killen 1980: 32, Oates 1980: 15). Another feature of this bed, which is also characteristic of the other examples, is the employment of leather straps underneath the woven matting to support the weight of the body. The bed also continues with the footboard style mentioned above, but this time reverts back to a solid design, with simple repoussé[133] papyrus designs as decoration (Baker 1966: 102-103).

The royal folding bedstead (*Plate 59*) is perhaps one of the most unique items from the tomb, and serves as a valuable representation of utilitarian travel furniture from the New Kingdom. The mechanism for the hinges is quite simple, and is based on an interlocking system of hinge plates[134], held in place by a bronze pivot (Baker 1966: 104, Desroches-Noblecourt 1972: 138, Fagan 2004: 72, Killen 1980: 33). Once folded, the item would form a compact unit that could be lifted and transported with ease. This folding action is demonstrated by a functional model (*Plate 59*) of an almost identical camping bed from the 18th Dynasty. The model depicts the bed as consisting of two parts with only a single hinge, which suggests that variations also existed within the design of these exceptional items. The model predates the life-sized example of Tutankhamun by approximately 100 years (Scott 1965: 139), indicating that the Boy King's bed was not the first of its kind.

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[132] Personal observation: These metal tacks were also of gold and the domed shape is characteristic of later times, as those from earlier periods have either flat heads or none at all. As time progressed the domed shape became more pronounced, perhaps to serve a decorative purpose along with a functional one.

[133] In repoussé work, the design is hammered into the reverse side of the panel, resulting in a relief style design on the front of the panel (Hawass & Garret 2005: 60).

[134] See the discussion on hinge mechanisms in the previous chapter for more detail.

6.3.4 Stools (Old Kingdom)

Stools were the most common everyday item used by the ancient Egyptians. For the average person, even though you could not own a bed, stool or chair of your own, you probably sat on the workshop's roughly carved stool while making a pair of leather sandals, or carving a luxurious bed for a palace inhabitant. The evolution of this simple utilitarian object led to the development of varying styles and the creation of new types. These developments were by no means confined to a linear chronology, where one type completely replaced another, but rather existed in a context where numerous styles overlapped (Killen 1980: 37, Manuelian 1985: 103). In fact, so many variable styles developed over the centuries, that by the time Tutankhamun reigned over the land 6 or more different styles were in popular use (Hawass & Garret 2005: 194).

The first stools were very low to the ground, lifting the user but a few centimetres off the floor surface (Manuelian 1985: 103). In this regard, the stool not only fulfilled a utilitarian function, but also a symbolic one. The stool (and later the chair) positions the individual on a higher level when compared to his inferiors and thus reflects the socio-economic affluence of the user (Scott 1965: 133). In addition, the use of bovine-shaped legs further improved the image of the owner, as it reflected strength and superiority.

During Predynastic times some of the earliest stools were carved from stone blocks or tree stumps, often in a simple four (*Image 43*) or three-legged[135] (*Plate 60*) styles.

[135] The three-legged stool continued to be popular throughout Egypt's history, with more elaborate design and decorative motifs emerging during the New Kingdom. Interestingly enough, a three-legged chair from the tomb of Tutankhamun clearly depicts decorative motifs in the form of Cretan spirals around the rim (Baker 1966: 91). This in itself is indicative of the emerging international style prevalent across the Ancient Near East and Mediterranean coast during this time period. Also refer to *Image 44 and 45*.

Image 43: Crude wooden stools from Kahum, 12th Dynasty.

Image 44: The development of the three-legged stool. From left to right: 3rd Dynasty, 18th Dynasty, 18-19th Dynasty.

Image 45: The royal three-legged stool from the tomb of Tutankhamun.

Although we do not have any examples of stools from the 1st Dynasty, well preserved stelae from the 2nd Dynasty tombs at Helwan indicate that stools were already well known at this time. The stelae are quite detailed and depict stools with bovine-shaped legs, papyrus umbelled style side rails and high backrests[136] (*Image 46*) (Killen 1994a: 27, Killen 2001: 580). A large proportion of the stools are significantly higher than bedsteads, which would have allowed for a more upright seated posture (Killen 1980: 37). One of the earliest surviving examples from the material record closely resembles bed frames from the same period (*Image 42*) (Killen 1980: 37).

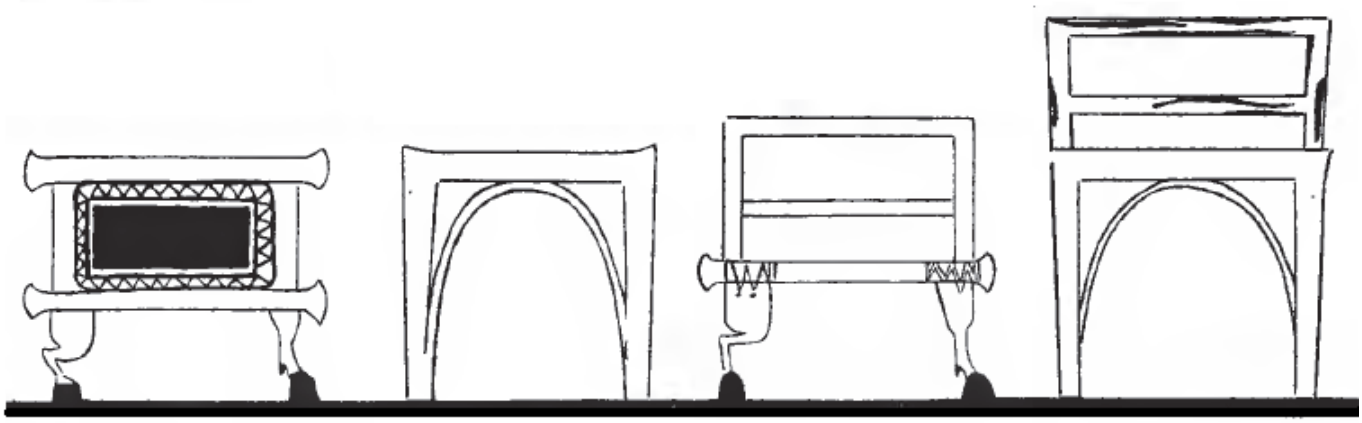
Image 46: Stools from the stelae of Helwan.

Image 47: The close resemblance between stool frames and bed frames from the same period is clearly visible.

Once again the tomb of Hesy-Re provides us with examples (*Image 48*) of styles from the 3rd Dynasty (Oates 1981: 13). Killen (1980) and Quibell (1913) mention the representation of two types of stools and two types of low chairs, yet the items classified as chairs

[136] The stela of Nesuhewet at Helwan, and that of Sehefner at Saqqara, indicate that high-backed chairs were already in use during the 2nd Dynasty, but that they were most probably reserved for royal use, and only later came into general use (Leospo 1987: 133).

resemble the stools so closely that we can discuss them within this section. This is because, as Killen (1980) and Manuelian (1985) mention, there was a general overlap between styles, and at this early stage in history there was no clear distinction between what defines a stool and what constitutes a chair. Furthermore, it is a basic evolutionary step for a stool to develop a backrest, and thus over time become a chair. However, at this stage there existed too many similarities to separate them indefinitely.



48a ***48b*** ***48c*** ***48d***

Image 48: Styles from the tomb of Hesy-Re

The first style (*Image 48a*) is typical of Early Dynastic times and presents us with a bull-legged low stool, incorporating papyrus umbelled side poles and a black leather seat. Red leather thongs resembling modern trampoline springs are used to attach the seat to the frame of the stool, a method identical to that of bed construction (*also refer to Plate 52*). The second style (*Image 48b*) is a simple rectangular stool made of light coloured wood, with straight legs and an arched stretcher[137] supporting the seat. The third and fourth styles (*Image 48c and d*) see the incorporation of a low backrest to the first two designs. From the illustrations these backrests actually appear as armrests to the modern viewer, but when comparing these to other representations of furniture from the tomb, one finds that the artists often combined frontal and profile views[138] in order to represent the key

[137] Quibell (1913) mentions that this arch is made out of bent wood.
[138] This is also observable in the beds discussed in the earlier section.

characteristics of items in one single drawing (Killen 1980: 38, Killen 1994b: 29, Quibell 1913: 27-28).

Although we do not possess detailed information, in either visual, textual or archaeological format, from earlier periods, much of the Old Kingdom styles would have been a continuation of those mentioned above.

6.3.5 Stools (Middle Kingdom)

With the progression of the Middle Kingdom we see the popular adoption of leonine legs alongside the introduction of a simple new style (9th – 12th Dynasties), which would subsequently influence the development of rounded furniture legs during the New Kingdom (Killen 1980: 39). Our first example comes from the tomb of Beni Hasan[139] and dates from the 12th Dynasty. The legs are rounded towards the top, which means that the frame is affixed to the side of the leg, and not on top, as is usually the case with bovine, leonine or straight legs. The sides are straight and flat, and the legs are narrower towards the bottom, where-after they flare outward to meet with a bevelled support pad (*Image 49*) (Killen 1980: 39, Killen 1994a: 37, Killen 2002: 650).

Image 49: A stool with outward flaring legs.

[139] The tombs of Beni Hasan provide us with numerous examples of furniture, yet the main significance behind the discoveries does not lie with the survival of the material remains themselves, but rather with the idea that the collection represents the desires of everyday men and women to own furniture (Killen 2002: 654).

The same design is encountered frequently during the following centuries, and would become a popular alternative to thereomorphic forms during the New Kingdom. Examples (*Plate 61*) from this period include a dark wood stool with a leather lashing seat, the stool of Hatshepsut and a wicker seated stools from the 18th Dynasty (Scott 1965: 137). These legs were also popular for beds, as demonstrated by *Plate 56.*

As mentioned in the previous sections, the popular use of leonine legs is well documented from a number of sources from the Middle Kingdom. One such example (*Image 50*) is currently housed in the Victoria Museum in Uppsala, and is characterised by a thin layer of white gesso (Killen 1980: 38). The stool is quite plain in design, and resembles similar items from the New Kingdom (*refer to Plates 49 and 50*). The support cones are clearly narrowed towards the bottom, suggesting that the truncation of cones had already begun during the Middle Kingdom.

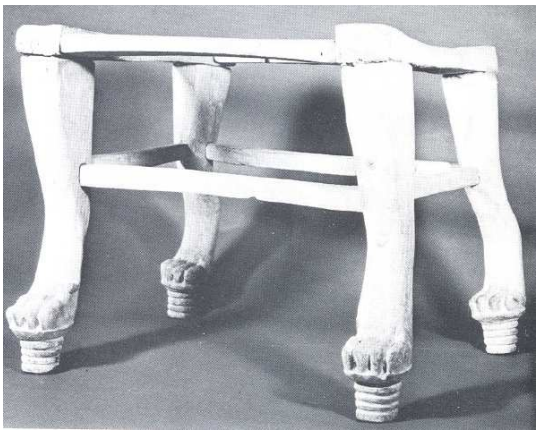


Image 50: Leonine chair, Middle Kingdom.

6.3.6 Stools (New Kingdom)

In contrast to the limited discussions about stools from the Middle Kingdom period, experts in the field of Ancient Egyptian furniture have studied the numerous examples from the New Kingdom in detail. A multiplicity of surviving units have been recovered from a number of tombs across the land, with the best examples once again originating from the tomb of Tutankhamun.

Our first example has been dated to the 18th Dynasty and comes from the tomb of Kha and Merit. The stool (*Image 51*) closely resembles those documented in *Plate 50* and continues with the tradition of coating items with a layer of gesso. The stool is well preserved, except for a few chip marks in the coating, which inadvertently reveal the low quality of the wood (Killen 1980: 39).

Image 51: Stool from the tomb of Kha and Merit, 18th Dynasty.

The most common link between different styles within the New Kingdom is the popular use of the leonine leg design. The shape is employed in simple styles, such as those discussed above, as well as more complex creations. Our examples in this instance originate from the tomb of Tutankhamun, and present us with a plain white gesso covered stool (*Plate 62*), along with a more elaborately decorated stool covered in a thin gilt sheet, and boasting copper plated support cones. Both stools display a double concave[140] seat design with a floral motif between the front and hind legs representing the unification of Upper and Lower Egypt[141] (Killen 1980: 47-48). Upon closer investigation one observes that the support cones are horizontally rounded along three quarters of the circumference of the object, and then flatten towards the back of the cone[142]. It is difficult to say whether or not this is a common feature of cones during this period, as the larger majority of furniture items are

[140] The earliest double concave or double cove seats date to the early New Kingdom. Given that the shape itself would have been difficult to fashion from a solid piece of wood, they are most often constructed out of bent slats of wood. The shape was originally applied to stools, but became a popular chair design during the Amarna Period. The concave shape was also adopted, to a lesser extent, by beds from the same period (Eaton-Krauss 2008: 63).

[141] While any individual could own a chair with leonine legs, the unification motif was reserved for royalty, more specifically the King or Queen (Eaton-Krauss 2008: 106).

[142] Refer to *Image 52* for an illustration of this design.

photographed from the front. Killen's (1980) unusually angled photo provides us with a unique view which is seldom encountered in documentary sources (*Image 52*). In addition the seats boast cavetto cornices with torus mouldings decorating the joints, while the popular unification motif is visible on the stretchers (Eaton-Krauss 2008: 103).

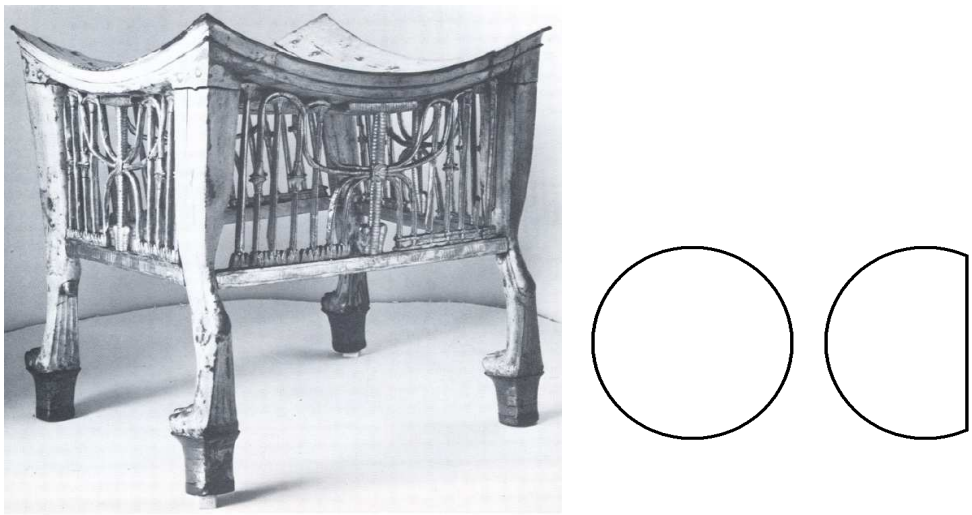


Image 52: Stool with unique cone shape[143].

In briefly staying with the double concave seat design, let us now look at another example from the tomb of Tutankhamun (*Plate 63*). While the shape of the seat is similar to the examples mentioned above, this stool was designed to incorporate a solid seat. This feature is impressive, as the solidly carved base of the seat had to accommodate, and adhere to, the curvature seat frame. The rest of the design is quite simple, employing straight legs supported by vertical, horizontal and diagonal cross slats known as lattice work[144]. The last mentioned design feature is repeated in another example from the 19th Dynasty, this time boasting a straight, uncurved seat. Both examples are once again coated in a white gesso[145] (Baker 1966: 86 & 134, Eaton-Krauss 2008: 109).

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[143] Bi-sectional top view of support cone illustrating the flattened back quarter of the design (right) as opposed to the conventional uniformed round design (left). (*Author's own illustration*).

[144] The method of incorporating support slats is more commonly referred to as either lattice work or 'trellis work'. These angled slats use the method of triangulation to increase rigidity and strength (Fagan 2004: 73), allowing for the incorporation of longer, thinner legs. This unique and characteristically Egyptian style was used mainly during the New Kingdom, seeing ownership throughout all levels of society (Eaton-Krauss 2008: 108). (*Also refer to Plates 73c -73f for further examples of this method*).

[145] Personal observation: In numerous examples of gesso covered furniture, evidence exists that the white covering was used to hide the inferior quality of the underlying wood, but with items originating from the tomb

Image 53: A collection of lattice work chairs.

To illustrate the continued employment (and further development) of the leonine style, let us briefly discuss the stool mentioned earlier. Our first example (*Plate 64*) demonstrates a fairly primitive application of the full-bodied lion style. Apart from the lion-headed capitals discussed above, the stool also boasts finely carved leonine features, along with the guide holes needed to attach a woven lashing seat. In spite of the rough appearance of the carved heads, which would at first glance tempt us to place the item within an earlier period, we know that lion-headed capitals were already well developed during the Middle Kingdom, and that this unique example perhaps represents a failed attempt or later re-carving.

A more well executed full-bodied lion style is seen in the footstool (*Plate 64*) from a later period (Baker 1966: 128). The lions are skilfully carved, with the manes intricately carved to highlight the bushy leonine hair. Because the item originates from a private collection, with no reference made to the original context, a specific date cannot be

of Tutankhamun (and other royal tombs for that matter), such as those illustrated by *Plates 62, 63 and Image 53*, the colour might rather be connected with symbology. This is because carpenters would rarely insult their own trade by producing items of inferior quality wood for their royal clients.

provided. The only clues lie with the style of the carving and die cavetto corniced support cones, which suggests a late New Kingdom or Graeco-Roman timeframe.

Stool legs also appear in various other thereomorphic forms, with duck's heads being one of the more popular designs. This stool (*Plate 65*) is dated to the New Kingdom and originated from one of the Theban tombs. The legs boast a turned appearance, providing a smooth, perfectly round shaft, which ends off in stylised ducks' heads. The curved head itself is supported by a cone that tapers towards the top (unlike other cones that taper towards the bottom). This popular motif appears again in the design of folding stool legs from various stages in Egypt's history (Desroches-Noblecourt 1972: 196) and is said to represent the forces of chaos, with the twisted back head (*Image 58 and 59*) representing the ritual sacrifice of the animal (Leospo 1987: 147).

Although animal designs were exceptionally popular, simple rounded stool legs were also in regular use. Although these legs may appear turned, they were in fact hand-carved, as the lathe was only developed during the 5th century BC (Fagan 2004: 75, Leospo 1987: 125, Oates 1981: 18). One of our earliest examples (*Plate 66*) dates from the 12th Dynasty and originates from Dira Abu el-Naga near Thebes[146]. The legs are decorated with horizontal lines grouped in fours, while the seat is shaped in the double concave design. Compared to similar items, the legs of this stool taper only slightly towards the bottom half of the leg, while other examples boast a more concave or flared appearance[147]. An example of this development is provided by another stool (*Plate 66*) dating from the New Kingdom[148]. The first image presents us with a perfect view of the bare frame, while the second, with its reconstructed leather seat, depicts one of the popular methods of creating comfortable seats from dyed leather. The stool (*Plate 66*) depicts the concave shape that would become standard in this design during the New Kingdom (Scott 1965: 138).

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[146] Stools with flared legs were popular among all members of society, but the first example of its royal use appears in the tomb of Tjunena, which has been dated to the reign of Thutmose IV (Eaton-Krauss 2008: 121).
[147] The technical term for this concave shape is waisting/waisted (Hayes 1935: 34). The legs are generally concave in the lower half of the leg, and flare out towards the bottom (Baker 1966: 138).
[148] The museum database does not provide a specific date.

As mentioned before, items of furniture were often covered in a layer of gesso or paint (or painted gesso) to hide the inferior quality of certain wood types (Leospo 1987: 126). An example (*Plate 66*) from the 19th Dynasty not only demonstrates this practice, but also demonstrates the continued popularity of the style discussed above. Whereas certain items represent the "cover-up jobs" of the ancient world, others stand as testimony to the workmanship of Egyptian carpenters. One such example is dated to the 18th dynasty (*Image 54*) and boasts similar legs to the ones discussed above. The main characteristics of this stool include unique ivory inlays adorning the legs of the item, coupled with circular ivory rods that form support braces between the legs (Baker 1966: 135, Goodwin 2006: 4, Killen 1994b: 45, Killen 1980: 49).

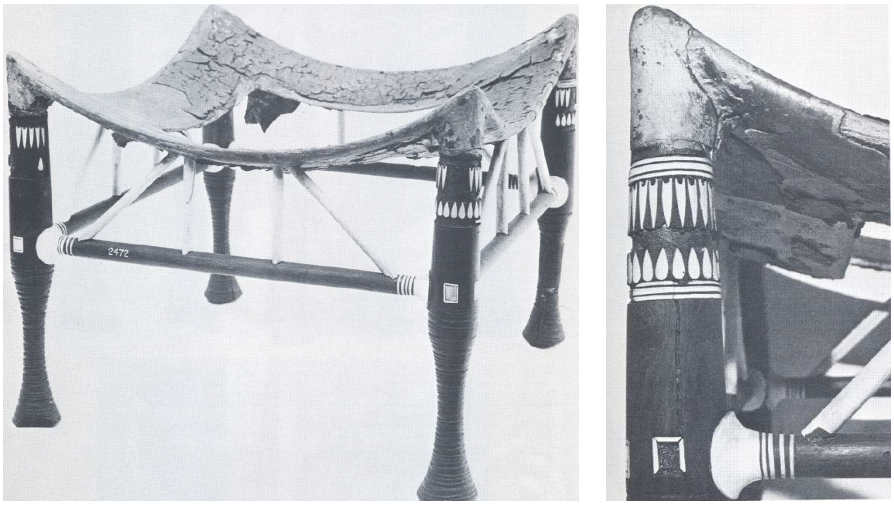

Image 54: The stool with ivory support braces.

This brings us to our discussion on folding stools. These utilitarian items were perhaps the second most popular everyday items after regular low stools, and represent a technological innovation that would later give rise to the development of folding beds. Although we do not have any examples from the Old Kingdom for our discussion, experts believe that these items were created during this period. The first textual evidence comes from an inscription Amenemhat IV of the 12th Dynasty. From a more symbolic point of view, it is believed that

the folding stool evolved from a simple camping stool during the Old and Middle Kingdoms, to a symbol of royalty and status during the New Kingdom[149] (Leospo 1987: 146).

Our first example (*Image 55*) comes from Meir and has been dated to between 1600-1500 BC (Middle Kingdom), and is constructed from cedar wood. Because these items needed to be both lightweight and sturdy, ancient carpenters constructed them from two frames. The dual sections are then linked by a dowel-like joint pin that facilitated the hinge movement and allowed the chair to be folded flat. In order for the construction to remain rigid enough for use, the seat would be glued to the frame, while leather support straps underneath the seat would help to bear the weight (Baker 1966: 137, Fagan 2004: 73, Killen 1980: 40, Scott 1965: 139). The seat thus played an important role in the construction, as it prevented the legs from collapsing outward once the user sat down.

Image 55: A simple cedar folding chair with a leather seat, Middle Kingdom.

Our second example (*Image 56*) from the Middle Kingdom is an exceptional item, and boasts a rare double leg design. The structure is incredibly stable, as it has four connecting spindles on each frame joined by a unique pinning method. The leather seat is a modern replica that is folded over the edge of the seat rails and glued in position (Killen 1980: 40).

[149] During the 18th Dynasty people in high positions, including prince Heqanefer of Miam in Nubia, held the title of “bearer of the folding stool of the Lord of the Two Lands” (Leospo 1987: 146).

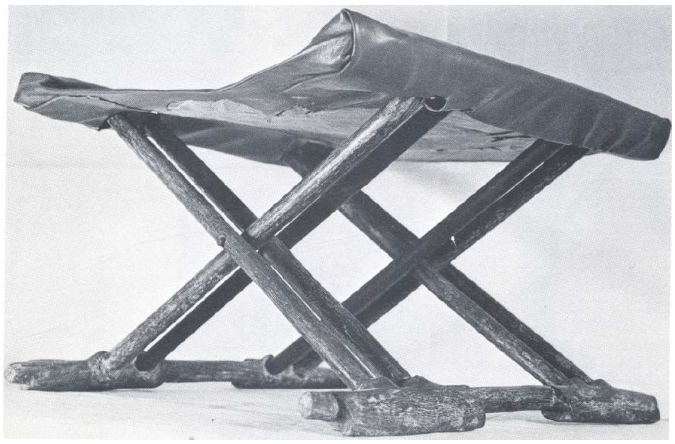

Image 56: Folding chair, Middle Kingdom.

With reference to the earlier discussion on duck's head motifs, two examples of folding chairs from the New Kingdom continue this decorative motif, with variations in the positioning of the heads themselves. The first example[150] (*Plate 68*) sees the positioning of the stylised head in such a way that the beak of the animal meets the foot rail (Goodwin 2006: 5, Wanscher 1980: 21). Upon closer investigation it appears that the beak opens slightly to accommodate a triangular tenon joint. The beak of the duck thus cleverly acts as a mortise. A similar example (*Image 57*) comes from the 18th Dynasty tomb of Kha (Leospo 1987: 143).

Image 57: The folding stool of Kha, 18th Dynasty

[150] Recovered from the tomb of Kha, Deir el-Medineh, by Schiaparelli's 1906 excavations.

The third example (*Image 58*) originates from the tomb of Ani in Thebes, and shows a variation in the design. Firstly, the ducks' heads on the lower part of the legs are more stylised and the beaks are not as clearly defined. Secondly, the foot rails end off in ducks' heads that curve back towards the railing (Baker 1966: 135, Killen 1994a: 46, Killen 1980: 40-41, Scott 1965: 138, Wanscher 1980: 57). In both instances, the stools feature rectangular seat rails that form a concave shape.

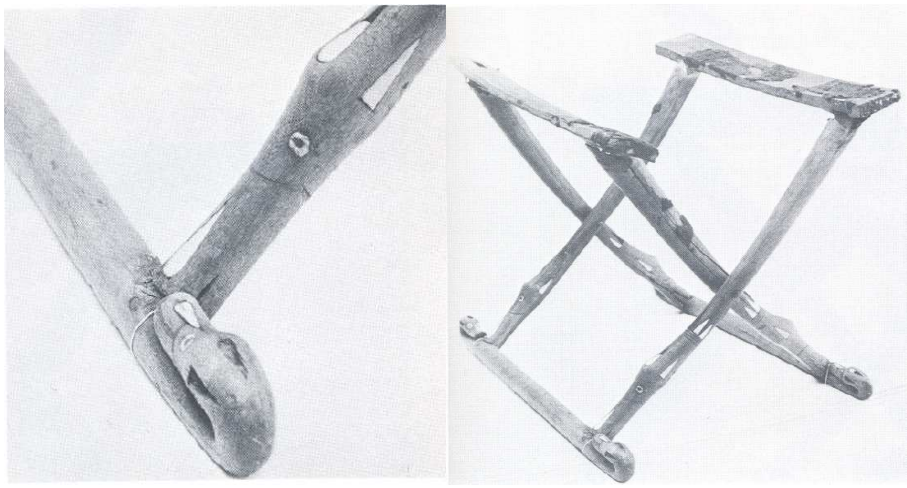

Image 58: Folding stool from the tomb of Ani.

Image 59 also presents us with further examples of the same style and period (18th & 19th Dynasties), while both Davis (2000b: 16) and Wanscher (1980: 59) make specific reference to the leg of an ebony folding chair from the tomb of Thutmose IV.

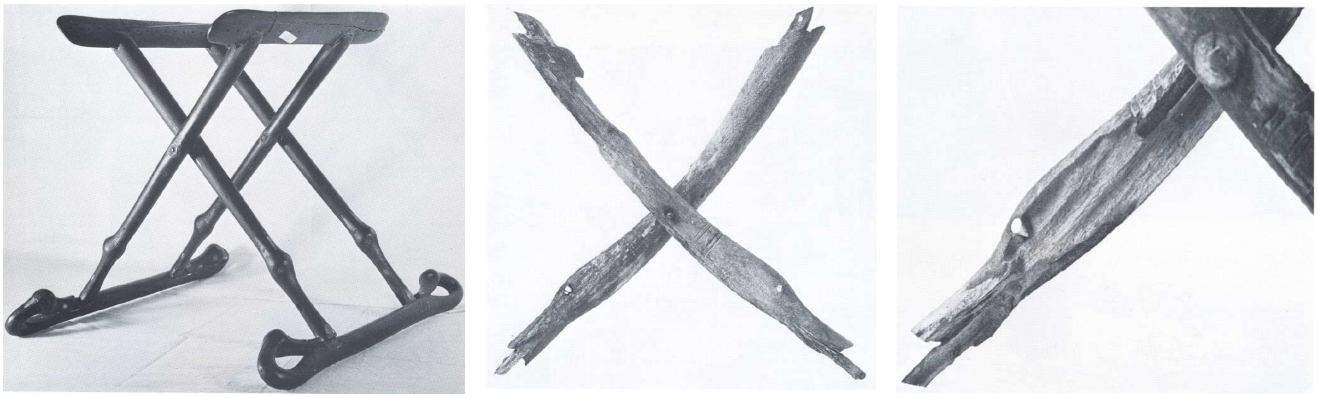

Image 59: Examples of the duck's head design.

Once again our most lavish examples come from the tomb of Tutankhamun. The first example (*Plate 69*) takes the form of a highly decorative folding chair, incorporating the now popular duck's head motifs. Once again, as with *Plate 68,* the beak of the animal widens to meet with the tenon joint carved as part of the foot rail. The head of the duck is lavishly decorated with ivory inlays, with fine gold work contrasting the dark colour of the wood. The ends of the foot rails are covered in gold plating, while the hinge pins are covered by rounded gold sheets (possibly to cover the unsightly working mechanism). Once again the seat follows the simple rectangular concave design typical of this style.

Our second example (*Plate 69*) from the tomb follows on the same basic design characteristics as the one discussed above. This item is a non-functional version, and presents us with a stylised animal print seat cover (Baker 1966: 87-89, Desroches-Noblecourt 1972: 147, Wanscher 1980: 27). The seat of the stool is made from a solid piece of wood that prevents the stool from folding. The legs continue in the popular duck shape of the period, and are affixed to a double concave seat by tenons. Ebony veneer is attached using a number of small pins, while a dark resin covers imperfections in the wood. The tail of the fake animal hide is exceptionally detailed and even includes an incised ivory tip intended to resemble hair (Eaton-Krauss 2008: 117-118).

Because three-legged stools were the most commonly used items of furniture in ancient Egypt, when it came to seating, it is natural that the Boy King himself would have owned a number of these. The three-legged chair of Tutankhamun (*Image 45*) is one of the most elaborately decorated examples of royal utilitarian furniture. The seat boasts an openwork relief carving of captive lions, lying in opposite directions, with the front and hind legs bound together[151]. The leonine motif is continued in the shape of the legs, which are reinforced by braces. The front brace is decorated with lattice work that once again incorporates the heraldic unification motif. The running spiral design around the edge of the

[151] This scene represents Tutankhamun's inherent prowess as a hunter and can be compared to hunting scenes from the reliefs at Karnak (Eaton-Krauss 2008: 125).

seat deviates from the more common geometric and floral designs, but is encountered in a number of other items from the tomb, suggesting that it was a popular motif during the reign of Tutankhamun (Eaton-Krauss 2008: 124-125).

6.3.7 Chairs (Old Kingdom)

The natural progression for a stool is to develop a backrest, thus evolving into a chair. Yet certain backrests were so low when seen in relation to the total height of the item that they are generally described as low-back chairs. As mentioned above, during the discussion on stools from the tomb of Hesy-Re, the majority of 'low-back' chairs closely resembled the style of stools, putting them into a 'cross-over' style between the classic stool and the true high-back chair.

The earliest prototypes were made of reeds, tightly bound together to form the frame, yet in the 2nd Dynasty the majority of items were now created from robust wooden frames (Leospo 1987: 132). Overall, chairs developed some time during the second dynasty, with Reisner's 1901 to 1903 excavations at Nega ed-Der delivering one of the earliest examples (*Image 60*) from this period (Killen 1980: 51). The chair has very simplified straight legs with a plain rectangular frame. The backrest has a slight, backwards leaning angle[152], combined with a rounded curve, which allows for greater comfort. The angled construction is supported by upright beams that are slotted directly into the back legs, while angle brackets provide additional support. The remnants of the original woven seat still remain, while the guide holes into which the woven threads were fed are clearly visible. The legs are also supported by horizontal slats that would have prevented the legs from buckling.

[152] Although inclined backs and lion-shaped legs, were already in use during Early Dynastic times, the combined use of both features was only employed from the Middle Kingdom onwards (Eaton-Krauss 2008: 36).

Image 60: A simple chair from Nega ed-Der, 2nd Dynasty.

From the 4th Dynasty we have the gold leaf chair of Queen Hetepheres[153] (*Plate 70*) as an example. The item is fairly simple in design, having a solid backrest and seat of roughly the same dimensions. The sharp-angled arm-rests[154] complement the design and are in keeping with the geometric theme of the chair. The stylised papyrus flowers provide a large, almost overbearing, decorative motif, while the slender lion legs look slightly out of place when compared to the rest of the chair. Similar low chairs with high backs and almost equally high armrests were quite common in the time of Hetepheres (Scott 1965: 136), and the size of the item itself represents the Old Kingdom's obsession with huge forms (Baker 1966: 41, Fagan 2004: 72, Killen 1981a: 59-61,Oates 1981: 13, Reisner 1929: 84-85).

Likewise, the second armchair (*Image 61*) from the tomb follows the same structural design but incorporates more elaborate decorative motifs. This armchair is less well-known and features a decorated backrest depicting stylised hawk feathers and flowers. It also has decorated armrests, featuring a hawk in flight grasping papyrus/lotus flower strands with its talons (Baker 1966: 42, Stevenson-Smith 1953: 28-30). Both items represent the earliest

[153] The image on the left is a reconstruction from the Boston Museum of Fine Arts, while the image on the right is the original artefact currently housed in the Egyptian Museum in Cairo.
[154] Although arm-rests were popular in both royal and common chairs during the Old and Middle Kingdoms, their popularity seems to have dwindled during the New Kingdom, as very few examples (except for royal items) boast arm-rests during later periods (Eaton-Krauss 2008: 36).

high back, high armrest chairs of their kind, and also stand as the only examples of this chair type from the Old Kingdom (Leospo 1987: 136).

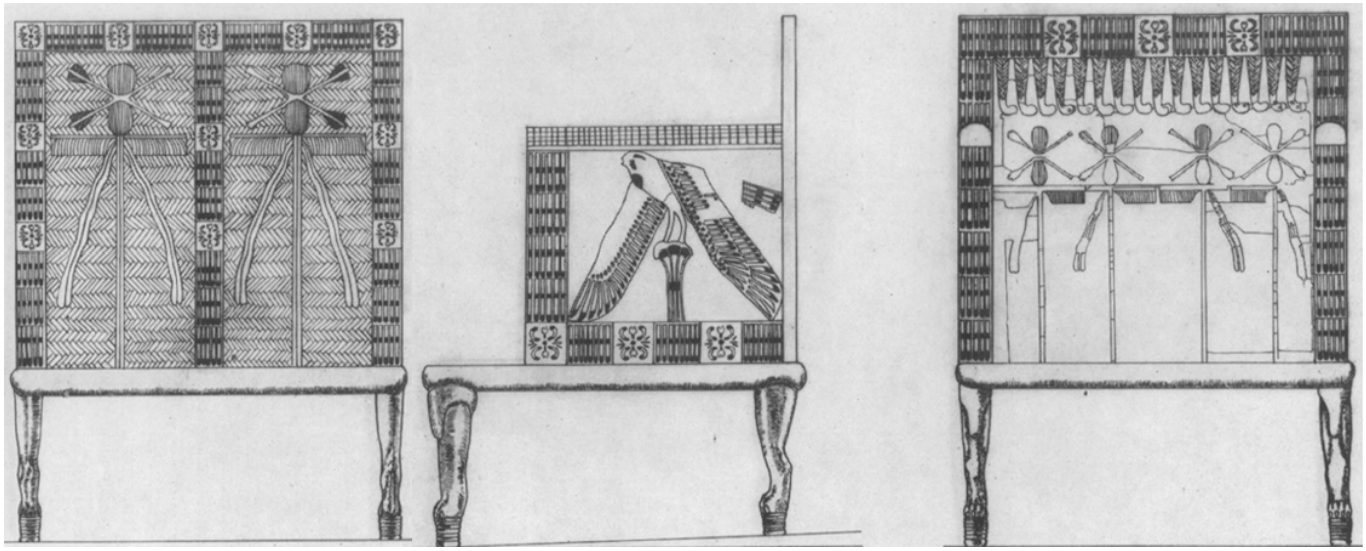

Image 61: The second armchair of Queen Hetepheres.

We once again encounter the use of high armrests during the 18th dynasty reign of Amenhotep III. Our example (*Plate 71*) bears the name of Sat-amen, granddaughter of Yuia (Iouiya) and Thuiu (Touiyou) (Davis 2000a: 37). The item incorporates characteristics from the chair of Hetepheres and the ebony chair of Tutankhamun (*Plate 103*), and includes anthropomorphic female figures instead of the traditional lion-headed capitals (Baker 1966: 63, Quibell 1908: 53-54). Interchanging wood types and veneers are used in the construction, and have been described by earlier researchers as walnut. Yet, later studies into the natural materials of ancient Egypt show no clear evidence for the use of walnut (Eaton-Krauss 1989: 87). In addition, the dancing Bes figures, on the left and right hand panels of the chair, resemble the design from Tutankhamun's ebony bed (*Plate 57*) and represent a popular design motif from the New Kingdom. Interestingly enough, the dancing god (*Image 62*) wears a kilt that displays close similarities with the embroidered kilts worn by Asiatic figures in Egyptian paintings and reliefs (Baker 1966: 66-67, Hadley 1987: 192). Davis (2000a) suggests that this feature might be the result of foreign influences.

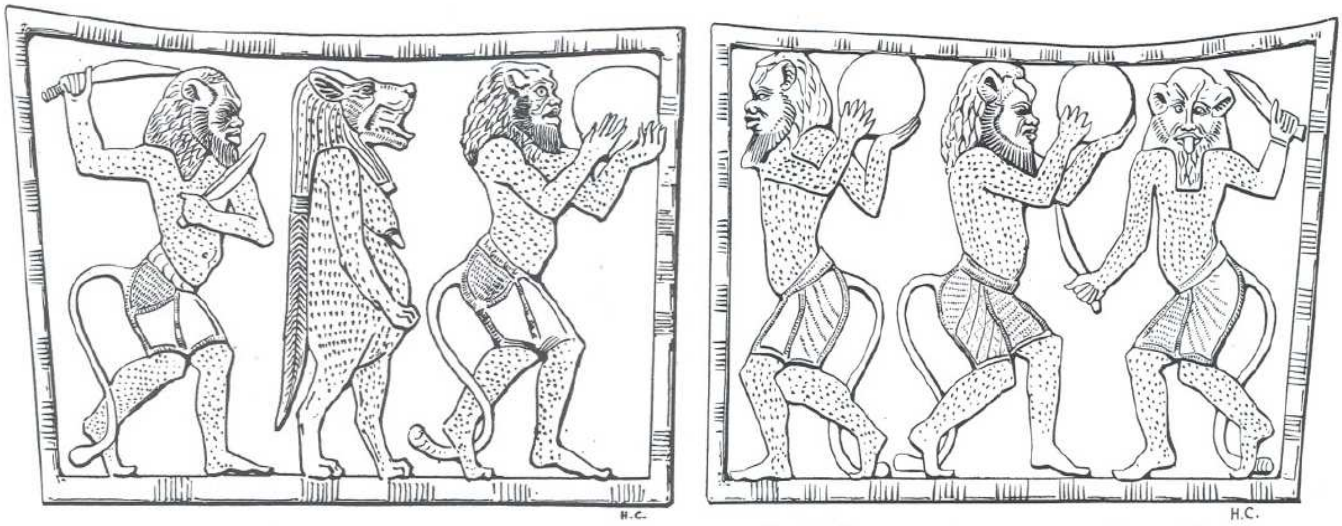

Image 62: Images of the god Bes from the chair of Sit-amon, 18th Dynasty.

Returning to the 5th Dynasty, our final example from the Old Kingdom comes from the tomb of Meryrenefer/Qar in Giza. A representation of Qar on a wall painting depicts the official as seated on a chair with lion-shaped legs (Brovarski 1996: 130). Images from the tombs of various high-ranking officials from the 6th Dynasty also confirm the popularity of low-backed chairs with thereomorphic shaped legs (*Image 63*) (Brovarski 1996: 144).

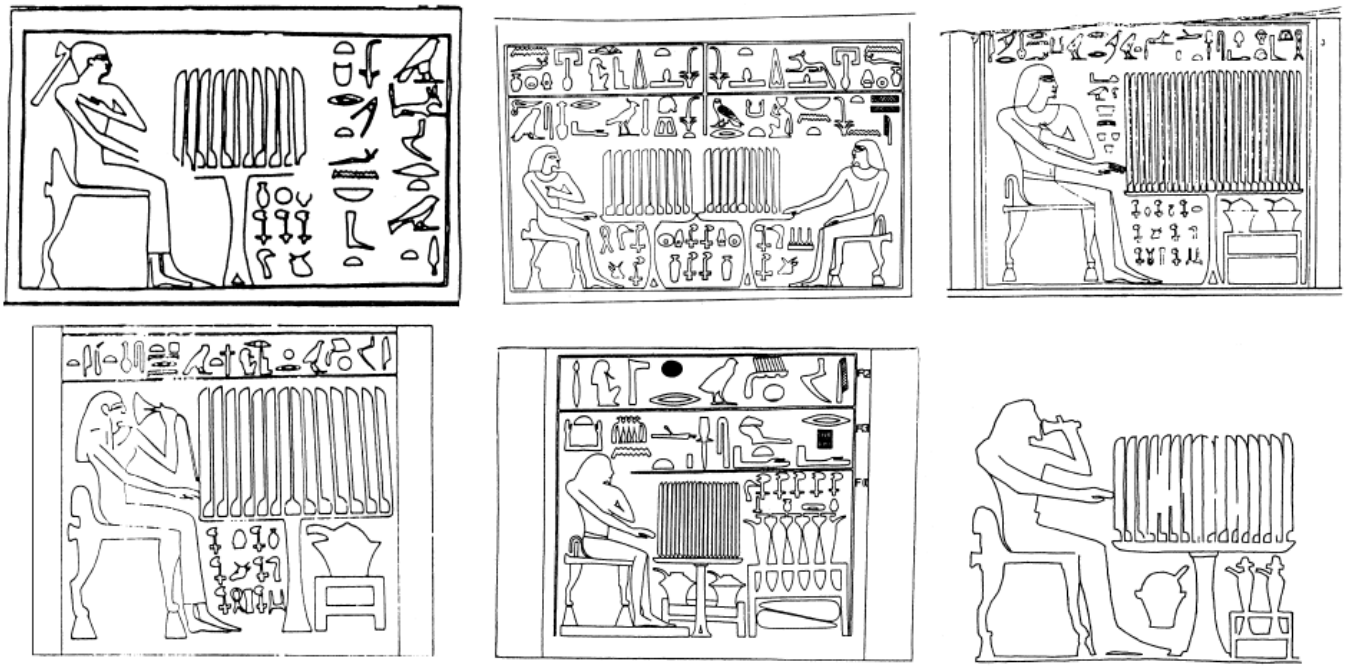

Image 63: Depictions of low-backed chairs from 6th Dynasty tombs.

6.3.8 Chairs (Middle Kingdom)

During the Old Kingdom numerous chairs were being manufactured with upholstered seats and backrest, a development that would continue throughout the Middle and New Kingdoms. Open back[155] constructions, such as those displayed by *Image 60*, continued to be in use, providing comfortable support to chairs without cushioned backrests and seats. Along with the popular adoption of lion and gazelle shaped legs, both classical bovine and traditional straight legs continued to adorn chairs from this period (Fagan 2004: 73, Killen 1980: 52, Killen 1994b: 40). We know from reliefs[156] and wall paintings that the high armrest design feature, as illustrated by the chair of Hetepheres, was still popular at the beginning of the Middle Kingdom. Evidence of this comes from the sarcophagus of Kawiyet, where the princess is seen having her hair done while seated on a straight-legged chair with square armrests (*Image 64*) (Scott 1965: 136).

Another example (*Image 64*) originates from the tomb of Meru in Abydos, and has been dated to the 11th Dynasty (Goodwin 2006: 4). The treasurer is depicted on a low-back chair with lion-shaped legs. The side rails continue with the Old Kingdom method of incorporating papyrus/lotus flower umbels into the design. The shape of the support cones is also interesting, as they narrow towards the top, while widening towards the bottom[157]. The majority of low-back chairs, both from the Old and Middle Kingdoms, are presented with covers or cushions draped over the backrest (Killen 1994a: 39).

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[155] The open back does not refer to the positioning of the backrest boards, but rather to the gap between the backrest itself and the upright support slat.

[156] Our main examples from the Middle Kingdom come from the stelas now housed in the Egyptian Museum in Cairo.

[157] It is uncertain whether or not this is a unique feature of the time period, or if the illustration can simply be attributed to artistic interpretation.

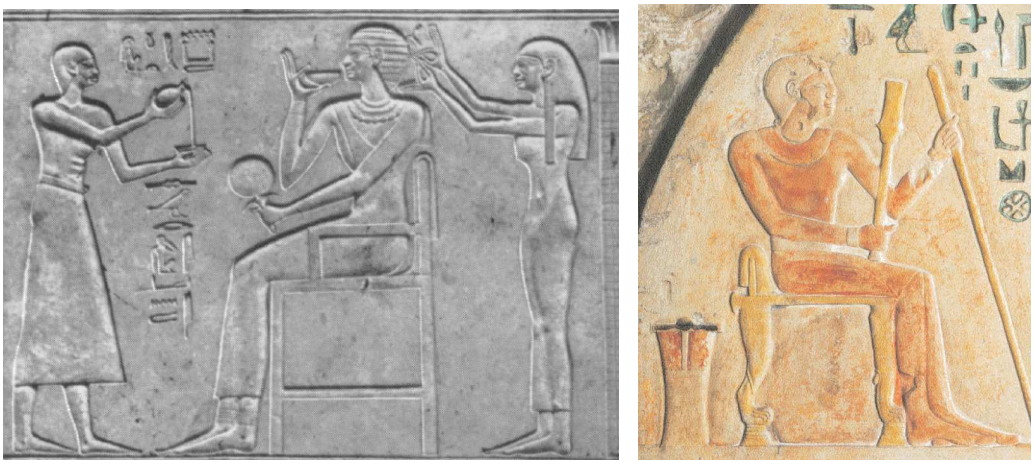

Image 64: Left: carving from the sarcophagus of Kawiret. Right: Relief painting from the tomb of Meru.

6.3.9 Chairs (New Kingdom)

Open back chairs from the New Kingdom shared many similarities with counterparts from the Old and Middle Kingdoms. The most observable resemblance was the employment of a slanted, curved backrest, supported by upright slats and angled brackets. These structural elements could be combined with either lion-shaped or straight legs. The majority of these items had woven rush or leather seats, and could most probably have been used in conjunction with a loose cushion[158]. Our first two examples from this period are almost identical in design, save for slight stylistic differences. The museum database provided no specific date within the New Kingdom for our first example (*Plate 72*), while Killen (1980) assigns *Image 65* to the 18th Dynasty. Both items appear to have been covered with a white paint[159].

[158] Art from the New Kingdom provides us with numerous examples of royalty seated on cushioned stools, chairs and couches. One such example comes from the carved ivory panel of a chest from the Tomb of Tutankhamun, and depicts the Boy King as seated on a cushioned high-backed chair while Queen Ankhesenamun sits on a cushion near his feet (Edwards 1972: 205). Tutankhamun is also seen sitting on a folding chair with a decorated cushion in a relief from his golden shrine (Hawass & Garret 2005: 185).

[159] In certain cases, chairs could be covered in a white paint and decorated with coloured paints in geometric designs, often resembling marquetry work. One such example is the 19th Dynasty chair from the tomb of Sennedjem (Baker 1966: 129).

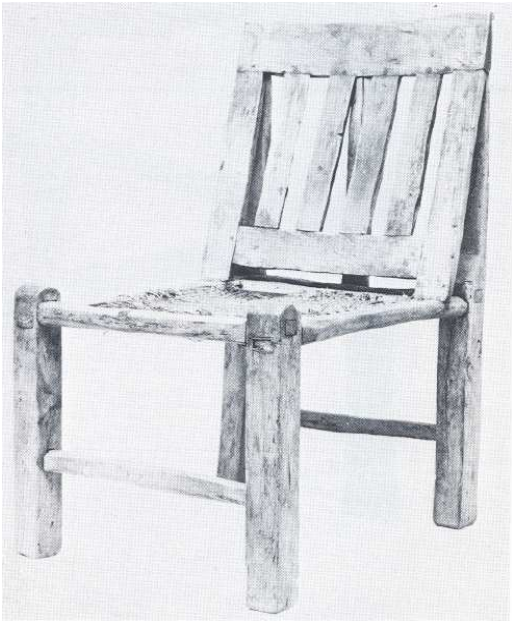

Image 65: A simple open back chair from the 18th Dynasty.

Similar in design, but flaunting lion-shaped legs, we have an open-backed chair (*Plate 72*) from the 18th Dynasty (Killen 1980). This item has been left bare of the white paint so characteristic of numerous New Kingdom chairs, and displays the rich brown colour of natural wood. In the previous two examples the backrest supports are either an extension of the back leg itself or joined into the leg using a mortise and tenon system. In this instance the support is affixed to the frame of the seat, rather than the leg, and relies on an angle bracket to keep it in position. In all three examples the top horizontal beam of the backrest is positioned in such a way that both the support beam and the angled backrest appear to merge together just below the horizontal beam (Baker 1966: 128, Williams 1920: 67-69). The carved backrest, along with the rounded stretcher, also represents innovations first encountered within the New Kingdom (Blakemore 2006: 19).

Our next example (*Plate 72*) is one of the most unique items from the furniture industry and represents a fashion that was often depicted in Egyptian art. This open back chair has been dated to the 18th or 19th Dynasties and is currently housed in the Louvre,

Paris[160]. Although the item's state of preservation was relatively high upon discovery, some restoration work had to be done. It was then (late 19th century) decided to paint the legs a striking blue (Baker 1966: 129), probably because no in-tact items displaying this colouration have been recovered (despite their frequent depiction in tomb art). The item overall displays similar structural characteristics to the 18th Dynasty example.

The chair of Kha (*Plate 72*) is styled in a similar fashion, but boasts a thick gesso covering. The seat frame and backrest are painted a light yellow, while the legs and back supports are painted black. The dark brown colour of the cones may have served to imitate bronze plating (as bronze-plated cones were popular during this period). The backrest is painted in such a way that it resembles the curved wooden panels of *Plates 95 and 96*. The chair originally belonged to the architect Kha, and was discovered in his 18th Dynasty tomb at Deir el-Medina (Leospo 1987: 140).

The low straight back chair from the 18th Dynasty (*Image 66 & Plate 73*) is currently housed in the British museum and represents a style that was in frequent use during the New Kingdom. The upright back may have presented the user with a less comfortable seat, when compared to the open back version, but would most likely have been used in conjunction with a loose cushion. Decoration takes the form of lotus leaves on the upper part of the backrest, while the backrest itself is made of different, interchanging wood panels. The contrast between the different wood provides the item with a unique feel that relies on the interplay between light and dark colours. Furthermore, we once again see the employment of an angle bracket to secure the backrest to the seat frame. In this instance the brackets are extended to meet the top of the backrest, thus giving a smooth appearance (Baker 1966: 184, Killen 1980: 57).

[160] http://www.louvre.fr/llv/oeuvres/detail_notice.jsp?CONTENT%3C%3Ecnt_id=10134198673392848&CURRENT_LLV_NOTICE%3C%3Ecnt_id=10134198673392848&FOLDER%3C%3Efolder_id=9852723696500807&fromDept=true&baseIndex=106&bmLocale=en

Image 66: Low-back chair from the 18th Dynasty.

Moreover, these low, straight-back chairs could also come with carved backrests[161], as is the case with the chair of Hatnofer (Hat-nufer) (*Plate 73*) from the 18th Dynasty tomb of Ramose (Baker 1966: 131, Scott 1965: 137). The item relies on the alternation of light and dark coloured wood to create a subtle aesthetic effect and incorporates an openwork technique to represent the god Bes alongside djeb pillars and tyet amulets (Blakemore 2006: 17).

Two more examples of simple, high-backed chairs both originate from the 18th Dynasty and closely resemble the examples mentioned above. The first (*Plate 73*) item is described by the Metropolitan Museum of Art's online database[162] as the chair of a woman from Dira Abu el-Naga in Upper Egypt. The item is manufactured from tamarisk and included some of the original linen string that formed the seat (which has since been

[161] The carving depicts the god Bes flanked by stylized Ankh and Djed pillar designs (Scott 1965: 124). The use of open relief carving became increasingly popular during the New Kingdom, and is skilfully employed in the cedar throne of Tutankhamun (Eaton-Krauss 2008: 64).

[162] http://www.metmuseum.org/works_of_art/collection_database/egyptian_art/chair_for_a_woman/objectview.aspx?page=308&sort=0&sortdir=asc&keyword=&fp=306&dd1=10&dd2=0&vw=1&collID=10&OID=100005543&vT=1&hi=0&ov=0

reconstructed) (Baker 1966: 132, Scott 1965: 141). The second (*Image 67*) item shares striking similarities with the chair from the Met, but is supported by simple square legs with rounded tops instead of lion-shaped legs.

Image 67: The item is almost identical to the Abu el-Naga chair.

From here we move on to more complex designs, combining intricate joinery work with lavish decoration. Our first example (*Image 68*) may seem a little primitive with its papyrus covering on the backrest and seat, but the ebony wood from which it is made clearly indicates that it was made for royalty. This straight-back chair from the tomb of Tutankhamun combines intricate lattice work, covered with thin strips of papyrus, with a double concave seat[163]. The backrest is probably supported by an angle bracket underneath the papyrus strips. The lion legs are incredibly slim line when compared to earlier chair legs, and represent a general narrowing tendency that would allow for taller, more elegant forms.

[163] In order to increase comfort, the Egyptians would use cushions in combination with these double-concave seats (Fagan 2004: 73).

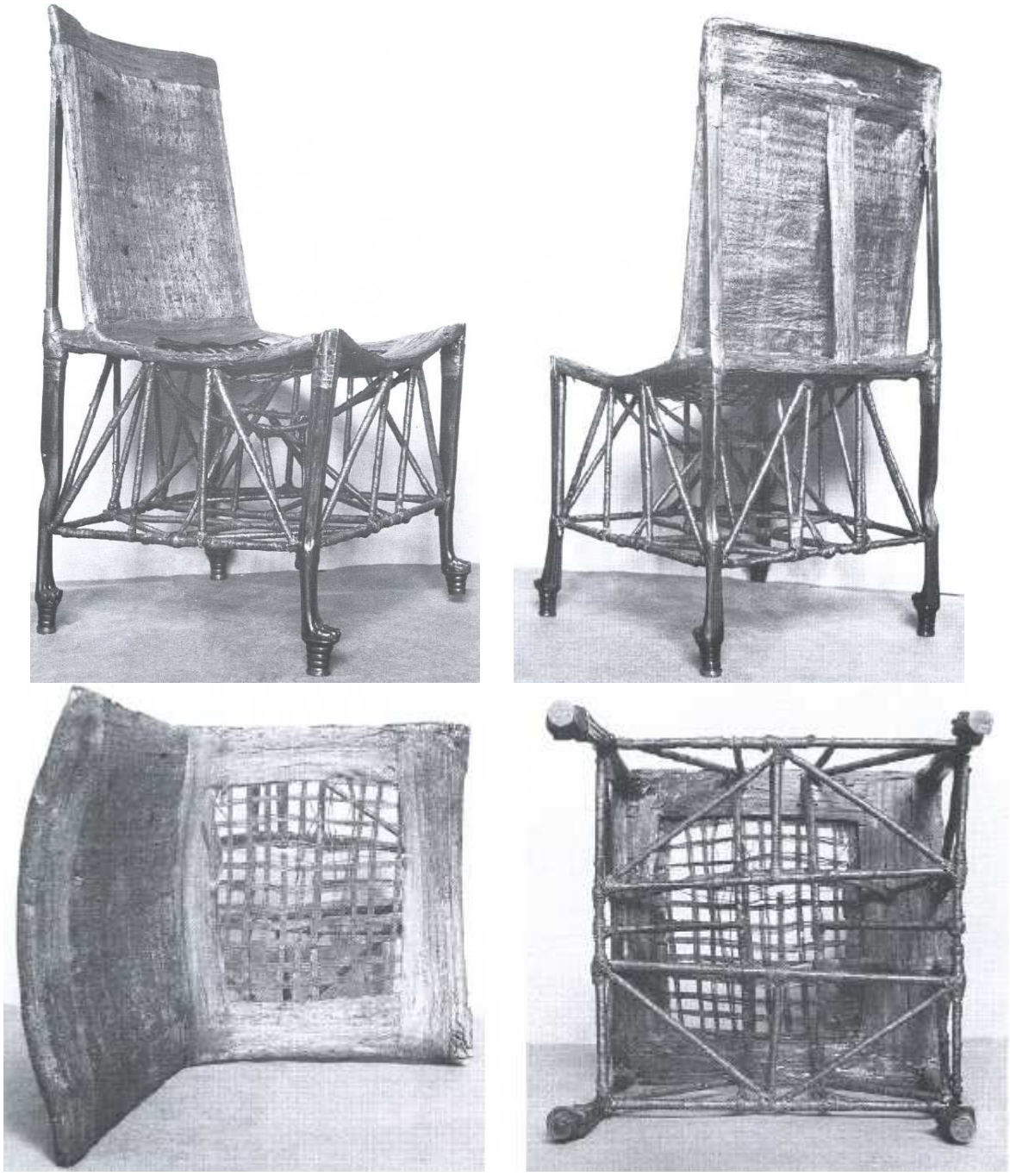

Image 68: Papyrus covered chair, 18th Dynasty[164].

One of the lesser known items from the tomb of Tutankhamun (*Image 69*) is a white painted chair with a falcon and hieroglyphic design carved into the backrest, often referred to as the child's throne (because of its scaled size). The style reverts back to the open back design, which stands as testimony to the ancient carpenter's skill of combining a slanted backrest with a double concave seat. Even the angle brackets supporting the backrest are skilfully

[164] *Plate 74:* Colour versions of images.

inserted, accommodating both the angle of the backrest along with the curvature of the seat[165]. Lattice work, incorporating intricate plant/floral designs[166], supports the slender lion-shaped legs. Gold work is limited to the lion claws and gilded support cones, in turn protected by bronze shoes (Baker 1966: 83, Eaton-Krauss 2008: 69, Killen 1980: 58, Scott 1965: 137 & 143).

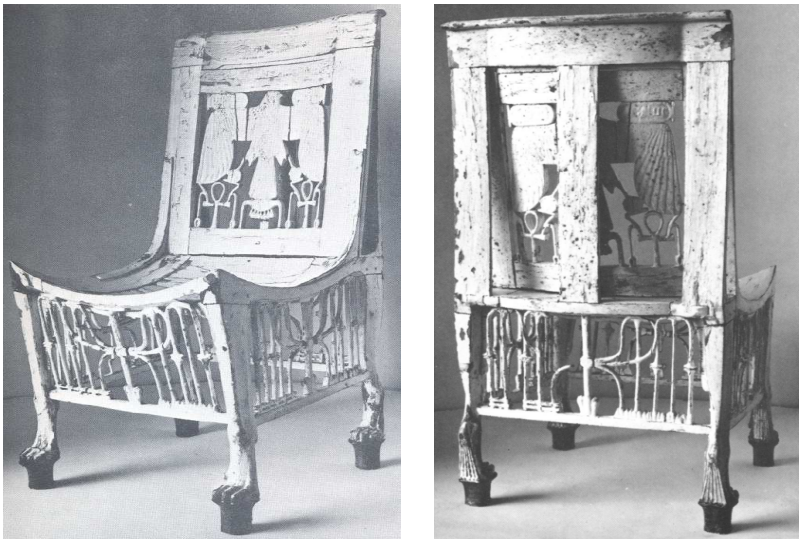

Image 69: White painted chair, tomb of Tutankhamun.

In a similar structural style we see the carved royal chair (*Plate 74*), also from the tomb of Tutankhamun. The backrest, seat and legs follow the above mentioned structural design, while the dark wood (identified as cedar), plated with shining gold work, provides a stark contrast to its white painted predecessor. The lion's nails are inlaid with ivory, and the gold-plated support cones are placed upon thick bronze disks or shoes[167]. The angle brackets supporting the backrest are covered in gold sheeting embossed with geometric designs, while a golden winged sun disk[168] adorns the top of the backrest. The entire design of the backrest is carved in openwork relief, depicting a kneeling *Heh*[169] figure, and is skilfully joined to the frame using a mortise and tenon system (Eaton-Krauss 2008: 59). In between

[165] This feature is repeated frequently within the tomb of Tutankhamun, as depicted in *Plates 99 – 101*.
[166] More specifically, the design is known as the unification motif and often incorporates the *sema* sign (Eaton-Krauss 2008: 76-77). Because this is an heraldic sign, its application is limited to royal furniture (Eaton-Krauss 2008: 121).
[167] Placing gold-plated support cones on bronze disks or shoes would have prevented the delicate gold work from being damaged by everyday use.
[168] The winged disk is known as *Behdety,* the great god (Eaton-Krauss 2008: 69).
[169] The kneeling *Heh* figure personifies perpetuity (Eaton-Krauss 2008: 64).

the legs we find horizontal support bars (also referred to as stretchers) of ungilded wood, supporting vertical gilded stretchers in the shape of *sema* signs. Knee braces (grooved and painted a reddish brown) also reinforce the joinery between the legs and the side rails. All the pins and dowels used to strengthen joints are neatly covered by golden caps that provide additional aesthetic appeal to the item (Baker 1966: 84-85, Eaton-Krauss 2008: 58, Killen 1980: 59).

The ceremonial chair (*Plate 75*) of Tutankhamun combines elements from 18th dynasty folding stools and open back chairs. The seat is supported by the traditional double frame of folding stools, while the slanted backrest is supported by vertical rails and angle brackets. The seat itself resembles the double concave shape of the items discussed above, but the curve is more dominant in one direction. The legs are once again shaped in the duck's head[170] design, allowing for the tenon to be socketed into the animal's beak. The gold covered lattice work between the legs resembles those encountered in *Plate 100*, but only half of the original construction remains. The rest of the chair is lavishly decorated by a combination of gold work, paint, stained ivory, calcite, carnelian and coloured glass, all of which contrast beautifully against the ebony backdrop. The seat is decorated with an painted ivory inlay that imitates the pattern of a cow hide[171] (similar to the mock folding chair seen in *Plate 88*), while rectangular inserts on the base of the seat contain inter-changing animal print (cow, leopard and giraffe) designs. Black rosettes of ebony and stained ivory are accompanied by lotus and tear-drop shaped inlays, with gold-headed nails affixing decorative panels to the chair (Baker 1966: 82, Desroches-Noblecourt 1972: IV, Eaton-Krauss 2008: 77, Killen 1980: 62, Wanscher 1980: 29, 39).

Tutankhamun's child's armchair (*Image 70*) once again relies on the contrast between the rich brown colour of ebony with gold foil and ivory inlay work. Although the chair has an ebony frame, the entire backrest is covered in papyrus strips that have been glued to the surface of the wood (Eaton-Krauss 2008: 98). The papyrus has been colour

[170] Duck's heads often had red stained ivory representing the tongue, while the eyes were skillfully crafted from ivory, overlaid with thin glass, into which pupils of ebony (or dark wood) were fitted (Eaton-Krauss 2008: 77).
[171] Howard Carter originally associated the design with the hide of the Nubian goat (Eaton-Krauss 2008: 87).

treated with a dark resin to closely resemble the accompanying ebony wood, a process which was executed with great success.

Image 70: Tutankhamun's child's chair.

The item has a double concave chair, combined with an open back and medium height arm supports. In contrast to the high, square armrests from the Old and Middle Kingdoms, armrests from the New Kingdom tend to be lower, and have rounded edges. Also, the use of geometric ivory inlays on the backrest, combined with the embossed gold work on the armrests and gold capped nails, continues the unique aesthetic appeal of New Kingdom furniture (Baker 1966: 84, Hawass & Garret 2005: 185, Killen 1980: 61, Killen 2001: 485). A simple, undecorated form of lattice work supports the legs (which are exceptionally thin), while gold-plated angle brackets support the backrest and armrests. In contrast to the conventional method of carving the top of the leg as one with the side rail, the child's armchair sees the entire leg slotted into a groove in the seat frame. What makes this design interesting is that the carpenter would have reverted back to the traditional Old and Middle

Kingdom method of securing the leg to the frame by use of leather or linen straps/bindings, which would have been fed through special holes cut into both leg and frame (Eaton-Krauss 2008: 97).

Our final, and most elaborate, example in this section represents the culmination of ancient Egyptian artistry from the furniture industry: the golden throne of Tutankhamun (*Plate 76*). The backrest resembles the popular curved open back design, which is supported by vertical support beams. Instead of the usual angle bracket fixture to help support the slanted backrest, we see the incorporation of the armrests as part of the support system. At the rear of the backrest we see four uraeus cobras capped with golden sun discs, ready to strike the enemies of the Pharaoh should they come near. The same motif appears again on both sides of the chair within the gap between the backrest and the horizontal support beams. The legs are also supported with horizontal stretchers, with the vertical stretchers carved in the shape of a *sema* sign. The armrest continues with this motif, featuring a winged uraeus[172] wearing the double crown of Upper and Lower Egypt. The wings of the creature form a slight curve to the armrest, while the cartouche bearing the name of the Boy King provides a rounded edge to the feature. The thereomorphic style is once again employed in the design, with leonine legs adorned by lion heads[173] on the front part of the throne. The claws of the lion are meticulously detailed and inlayed with blue faience. The seat is flat, and quite simple in structural design, but displays over two thousand inlaid squares of faience, polished glass, calcite and gold. The backrest displays one of the most well-known scenes from Egyptian art, depicting the young Pharaoh and his wife, blessed by the golden sunrays from above[174]. Despite the dark blue and deep red appearance of the majority of inlays, these are not true gems, but faience and polished

[172] The function of the uraeus is apotrapaic, as it protects the name of the Pharaoh inside the adjacent cartouche, thereby indirectly protecting the Pharaoh himself (Eaton-Krauss 2008: 36).

[173] The heads are placed on top of the legs as a decoration, and are not crafted as part of the leg itself. Therefore the design does not represent the full-bodied leonine design as discussed in our earlier section. According to Eaton-Krauss (2008: 28), the lion heads are attached using wooden pegs, metal pins and adhesives, thus indicating that the combined use of pins and adhesives was still common during the New Kingdom.

[174] Personal observation: Interestingly enough these sun rays end off in clearly defined hands, an artistic feature that became popular during the reign of his eccentric predecessor Akhenaton.

glass creations designed to imitate the originals[175]. The finer details of the chair are absolutely astounding, incorporating fine gold filigree work and minute individual inlay pieces, true semi-precious stones, calcite and majolica. The item is completely plated in gold, except for the bronze-plated support cones and silver-plated double crown design, with incised sockets within the metal designed to hold inlays. In addition, and from a technical point of view, the topmost sections of the legs actually form part of the seat, and represent a common Egyptian design feature (Baker 1966: 78, Desroches-Noblecourt 1972: XVII & IX, Eaton-Krauss 2008: 27, Killen 1980: 62, Oates 1981:15, Watson 1976: 10-11)[176].

Alongside elaborately decorated and/or gold-plated designs, regular relief carved designs were also popular throughout much of Egypt's history. Although the complete item did not survive, two side panels from the throne of Thutmose IV stand as our example. Both panels display identical scenes on the inner and outer sides of the panel. On the outer side (*Image 71*) of both panels we see Pharaoh Thutmose IV depicted as a sphinx, crushing foreign enemies beneath its paws, while the god Horus flies in his falcon form above the sphinx's tail.

Image 71: Carved side panels from the throne of Thutmose IV

[175] Personal observation: It is uncertain why the creators of this piece preferred faience and glass over true semi-precious stones, such as carnelian, turquoise and lapis lazuli, as these items were readily available during the New Kingdom. One may consider the possibility that the creators preferred these materials as they could be moulded directly into the desired shape, thus eliminating the need for endless hours of work carving the true materials. This topic is still open for discussion.

[176] http://heritage-key.com/blogs/prad/sandro-vanninis-photography-king-tutankhamuns-golden-throne

Hieroglyphic inscriptions record the king's name along with a short description of the events. The inner side sees the king seated on his throne before the lion-headed goddess Sekmet (also known as Urt-hekau), while the Ibis headed god of wisdom, Thoth, stands in a supportive position behind the throne (Davis 2000b: 20-21, Scott 1965: 148 - 149).

6.3.10 Footrests/Footstools (All periods)[177]

Footstools seem to have developed during the evolution of the low chair (or backrested stool) into the fully fledged high-backed chair. In this regard it seems obvious that there was no need for the use of a footstool if the chair itself was quite low to the ground. This is because low chairs were designed in such a way that the user would have no need for a footstool, as the everyday chair was designed to fit in with the height, and lower leg length, of the average ancient Egyptian. Yet with the development of the high-back chair, the proportions of furniture legs had to be adapted in order to accommodate the taller design. Thus, we see the creation of simple footstools that resemble basic, flat rectangular boxes. In some instances we do see the use of thereomorphic footstools that resemble the low stools of earlier periods, but these items were in the minority when compared to the flat box type.

Once again our biggest source of information originates from the tomb of Tutankhamun. Our first example (*Plate 77*) is of an unpainted footrest decorated with carvings of bound captives of various races. The front of the box identifies the owner as King Tutankhamun and includes the motif representing the unification of Upper and Lower Egypt. Each individual prisoner is flanked by nine bows, which represent the nine arch rivals of the empire. Inscriptions on the top, back and front of the item are significant, identifying the exact origins of the depicted Nubian captives as the remote lowlands of Fenekhu and the Khenthennefer region (Eaton-Krauss 2008: 128).

[177] As very few examples of footstools exist from ancient Egypt, save for the New Kingdom, our discussion on this item class will be grouped in one section.

The second is a highly decorative box (*Plate 77*) with sunken relief, inlaid with ivory, gold leaf and coloured tiles. The captive enemies are identified by their features as Africans and Asiatics[178], and are once again depicted with their hands tied behind their backs (Eaton-Krauss 2008: 132). The third (*Plate 77*) depicts one African and one Asian enemy, both of which have been bound at the waist instead of the wrists. The top image depicts them as lying separately on the ground, while the front and side panels depict them as lying intertwined foot to foot. The item is covered in a layer of painting gesso, which is inlaid with coloured glass (Eaton-Krauss 2008: 134). The idea behind the captive slave motif of the foot rest is for Pharaoh to rest with his feet upon the heads and backs of his captive enemies, in effect replicating the age old image of the Pharaoh crushing his enemies (Baker 1966: 83, Davis 2000c: 126, Wanscher 1980: 45).

The next two footrests from the tomb have been left unpainted in order to match with their unpainted accompanying chairs. The first (*Plate 77*) box is of a light wood and is decorated by rectangular inserts of interchanging dark and light wood, framed by thin strips of ivory (Eaton-Krauss 2008: 139). The second (*Plate 77*) box would have accompanied Tutankhamun's child's chair, and is stylistically similar to the one discussed above, although this time the item is made out of a much darker wood (ebony). The sunken relief decoration on the top of the box also features strips of different colour wood. These strips have been joined by metal pins capped with copper heads that provide additional decoration (Eaton-Krauss 2008: 135).

A variation on the simple rectangular footstool was the tall rectangular cushioned footstool (*Image 72*). This simple box-shaped footstool included a false bottom and open top, which accommodated a stuffed feathered cushion. This plump foot support would have been fastened to the false bottom using a combination of straps and tapes. Our examples

[178] Little variation in detail is encountered among enemies from the south. In contrast, foreign enemies are depicted with greater detail allowing for specific cultural identification. Southerners are identified by hooped earrings, bare chests and pleated kilts, while Libyans are identified by their curled sidelocks, pointed chin beards and feathers in their hair. Northerners are generally more heavily bearded, with cape-like garments identifying them as Asiatics. Syrians are specifically illustrated as wearing tasselled skirts with medallions around their necks (Eaton-Krauss 2008: 129).

from the tomb of Tutankhamun are exquisitely decorated with inlays of blue faience and gilded gesso figures. The top edges of the box are adorned by cavetto cornices and torus mouldings, both of which are gilded (Eaton-Krauss 2008: 143).

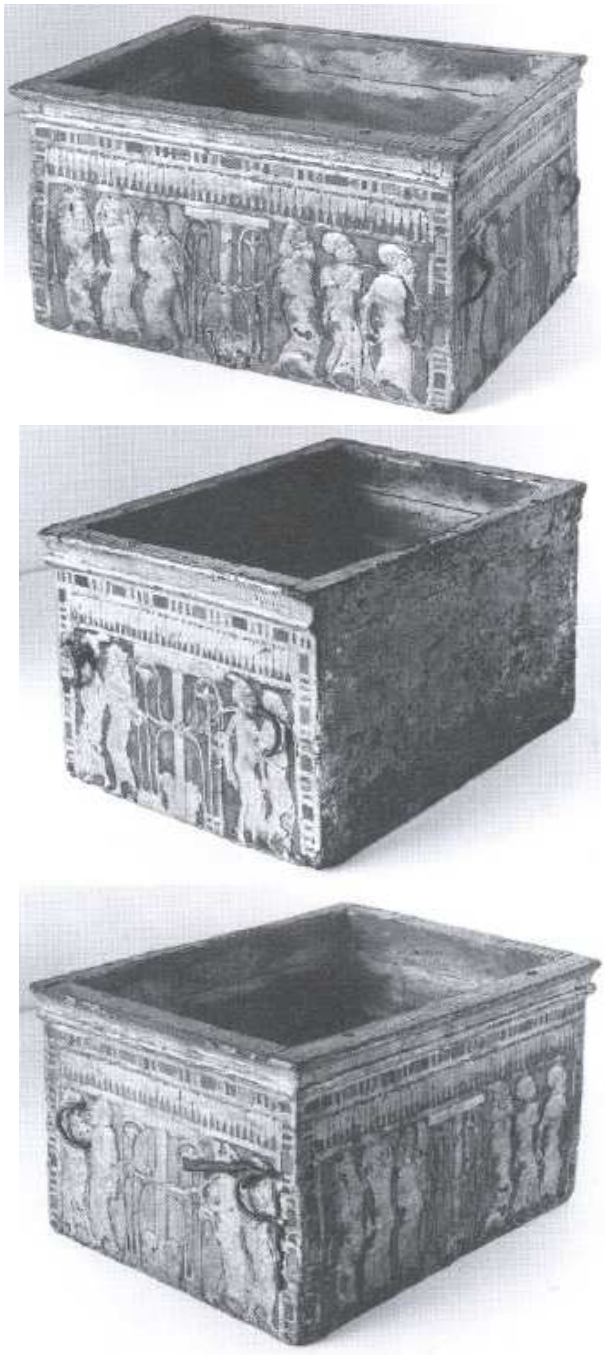

Image 72: *Footrests with cavetto cornices.*

Footrests[179] could also assume more elaborate forms, as is the case with the lion-shaped footstool[180] (*Plate 64*). Although no specific date or place of origin was provided by the

[179] Personal observation: In my work I refer to the simple rectangular shaped boxes (as seen in *Plate 77*) as footrests, while the more elaborately carved version, supported by four legs (*Plate 64*), are referred to as

consulted material[181] a stylistic comparison can help us to make an educated guess as to the period of its creation. When compared to the New Kingdom leg discussed under *Plate 50*, one will notice close similarities between the two items. Also, when referring back to the original introduction of full-bodied leonine styles during the Middle Kingdom, we can safely say that the footstool dates from either the Middle or New Kingdom.

6.3.11 Double-seater couch (All periods)

The double-seater couch can be seen as somewhat of an amalgamation between the low chair and the bed. Although we do not have many examples of surviving artefacts from the material record, we have frequent reference to the items from tomb art. Careful attention has been paid to illustrating the appearance of the wood, suggesting that it might have been created from a specific type of wood. The item comfortably seats two individuals, with a low backrest and throw-over cushion. The couch has been placed on a raised platform to lift it from the floor. An almost identical illustration comes from the tomb of Rekhmire (*Plate 78*).

These couches could vary in size, depending on the number of intended users. The 11th Dynasty artwork (*Plate 48*) from the tomb of Amenemhat and his family clearly illustrates that the couch could be used by more than two people at a time. In this instance the couch has low backrests on both ends of the item, suggesting that two individuals could sit facing each other while reclining against the cushioned backrest.

A variation on the double-seater couch is the bench (*Image 73*). This item (from the tomb of Tutankhamun[182]) closely resembles modern 'park benches' and may have developed out of the conjoining of two medium height chairs. Instead of the seated individuals facing each other, reclining against separate backrests, they would now sit next to each other, facing the same direction. The legs are straight and plain, while the backrest

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footstools. This is because the latter more closely resembles a low stool, and can be seen as a type of stool instead of just a footrest/footbox.

[180] Bottom image.

[181] *Glory of Ancient Egypt.* London: De Agostini UK Ltd. Pp 478 & 1150.

[182] http://www.globalegyptianmuseum.org/record.aspx?id=15539

is strengthened by a typical angle bracket. No decorations are visible and it is possible that the bench may have been used in conjunction with a loose cushion. The actual size (36cm in height) indicates that it may have belonged to Tutankhamun as a child, but it is possible that an adult-sized version may have been in use during this time.

Image 73: Bench from the tomb of Tutankhamun.

6.3.12 Mattresses and cushions (All periods)

Mattresses were fairly simple in design, and consisted of reed mats, enveloped by a double layer of linen, which would often be folded and tied in place with thin rope (Scott 1965: 139). These 'luxurious' items developed out of simple prototypes from earlier periods and were reserved for royalty[183] (and perhaps the more fortunate middle class). More primitive examples would have consisted of heaps of straw and dom palm leaves (Newberry 1942: 65), perhaps covered by a layer of thin linen or laid-out items of clothing.

Our main source of information once again originates from the richly detailed tomb art of Pharaohs and noblemen. One such example comes from the tomb of Ramose[184], a

[183] Although royalty and upper classes may have had access to softer mattresses, they fell short of preventing bed sores and ulcers. Research done by Thompson-Rowling (1961) indicates that mummies suffered from severe pressure sores during their lifetime as a result of inadequate support offered by hard mattresses.
[184] The tomb also produced a number of simple boxes, mostly painted white (James 1984: 200).

vizier during the 18th dynasty reign of Akhenaton. Scenes from the tomb clearly depict a range of furniture items being carried into the burial chamber: one specific illustration is of particular interest to our discussion. A dark wood bed with a simple footboard and leonine paws is adorned with a white mattress bearing red lines (*Plate 79*). It is uncertain what exactly these red lines represent, but it could be either a painted geometrical or straps holding the mattress in place. One bearer also carries a simple lattice work stool in his left hand (Hawass & Garret 2005: 125, Harris 1965: 10, Scott 1965: 146).

Another example (*Plate 79*) of a bed and mattress has also been dated to the 18th Dynasty and originates from the wall paintings in the tomb of Rameses III. This thereomorphic bed, with its leonine paws, tail and head, is topped by a thick, red upholstered mattress[185].

Cushions were introduced during Early Dynastic Period and were already well known by the 2nd Dynasty (Killen 1994a: 11, Leospo 1987: 137). It is possible that cushions were more commonly used, as they were smaller and more affordable, and would have represented a more frequently used utilitarian object, as more people (on average) would have possessed stools than beds. Some cushions appear to have been rather soft, allowing them to be draped over low backrests, while others must have been firm in order to provide support as a seat. Cushions could also be used independently (in a similar way to beanbag stools in modern times). Unfortunately, because these items were made of organic materials, few examples have preserved. We thus rely heavily on detailed images from tomb art.

In review of some of our earlier discussions on low stools and chairs, we can refer to earlier Plates to illustrate cushion use. These images mainly depict cushions used as backrest supports on low chairs or double-seaters. For an example of a cushion being used along with a stool, we have an image of Rameses III seated on a lattice work stool with a thick orange-red cushion (*Plate 79*).

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[185] *Glory of Ancient Egypt* 2002*:* 914.

In the case of high-backed chairs and thrones, the cushion consists of a single item covering both the seat and the backrest. In most cases the images illustrate the cushion as curling backwards and around the top of the backrest. In this regard it appears that high-back chairs may have been designed in such a way that the topmost segment of the item curves backward. No specific reference to this design feature has been mentioned in the consulted literature, nor have any such items been recovered from the archaeological record (that we know of), but the artwork from the period surely presents us with yet another design characteristic to look out for when investigating the furniture of ancient Egypt[186]. As an example we can turn to the 18th Dynasty tomb of Horemheb in Memphis. A relief carving (*Plate 79*) clearly depicts the owner of the tomb as seated on a high-backed chair with a thick cushion. Similarly, a padded throne (*Plate 79*) from the New Kingdom (probably 18th Dynasty) follows roughly the same principle, but displays a thicker, more padded cushion[187]. Both examples display the backwards curling top section of the backrest, indicating that this shape had a functional purpose related to the use of a large cushion[188].

Simple animal skins could also have been draped over items. Although these may have provided less support, the items would have meant more symbolically, representing power and influence. Although we do not have surviving examples, tomb and temple illustrations can once again provide information. An example comes from a casual scene of Tutankhamun and his wife: the Queen sits on a thick cushion on the floor by the King's feet, while he himself is seated on a folding stool (with a 'ball and claw' leg design). The Pharaoh sits on a thinner cushion, while an animal skin appears to be draped over the seat of the stool (under the cushion), with the legs and tail of the animal carefully wrapped around the legs of the stool (Baker 1966: 89-90). This became a popular adornment for stools during the 18th Dynasty, as testified by the numerous reliefs and paintings from the period.

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[186] This backwards curling design may have originated much later, as images from the Old Kingdom (including the stela of Sehefer) depict middle height backrests as straight, despite the use of a single cushion.
[187] More luxurious cushions were stuffed with the feathers of waterfowl, or could even be created from animal skins, including leopard, giraffe and zebra (Killen 1994a: 11).
[188] *Glory of Ancient Egypt* 2002: 129 & 1204.

Likewise, fake animal skins could also represent royalty. In most cases the tail of the animal is most prominent in the design, and was usually carved into the back rail or frame of the stool. In most cases, these designs do not feature enough detail (besides colour and pattern) to identify specific species. However, illustrations from Ramesside reliefs, depicting claws or calf heads enable us to identify the two most commonly used skins from the New Kingdom (Eaton-Krauss 2008: 87-88).

6.3.13 Boxes and chests (Old Kingdom)

Boxes and chests[189] are some of the more utilitarian items within the furniture industry. Although not everyone could own a chair or a bed, the majority of people[190] had some or other storage vessel in which to keep items of everyday use, including clothes, linen, makeup and jewellery (Liebowitz 1997: 352). Most people still made use of ordinary woven baskets for this purpose, yet simple boxes and chests made of lower quality wood were used more frequently as time progressed. Some of the earliest versions of more 'solid' boxes included prototypes made of pottery, as seen in *Image 74* dating from the Predynastic/Naqada II period. The item is decorated with painted flamingos (an animal motif that once again became popular during the reign of the black Pharaohs).

Image 74: Predynastic/Naqada II period box.

[189] Boxes and chests were mainly square or rectangular, but round boxes have been encountered, including the small, round box from the 1st Dynasty tomb of Hemaka (Leospo 1987: 133).

[190] John Garstang discovered a large number of tombs from the Middle Kingdom necropolis of Beni Hasan between 1902 and 1904. The burials of middle ranking officials contained numerous examples of wooden boxes (Killen 1994b: 28) and testify to the notion that middle class and lower ranking members of society could also own wooden boxes and chests.

Not many boxes and chests have survived intact from the Predynastic and Old Kingdom periods. Given this our first two examples will, in this instance, also be some of our most elaborate. Both items originate from the tomb of Queen Hetepheres, and have been beautifully reconstructed from the heavily decomposed remains of the tomb[191].

Image 75: The tomb of Queen Hetepheres. Note the physical state of the tomb upon discovery.

The first is a jewellery box (*Plate 80*) used to store a selection of beautifully decorated silver[192] bracelets with fine inlay[193] work (Baker 1966: 48). The entire box is covered, both internally and externally, with gold leaf while the inside of the box boasts two wooden rails on which the bangles were hung. A working hinge ensures that the box opens when the lid is lifted by the knob. Hieroglyphic text imprinted in the foil reads: "Mother of the king of Upper and Lower Egypt, Hetepheres" and "Casket containing bracelets"[194] (Killen 1994b, Reisner 1929: 85-87, Stevenson-Smith 1953: 27). The second item is a long and slender curtain box (*Image 76 & Plate 81*), which would have stood alongside the bed canopy. This rectangular box was made of solid planks of timber that were deeply carved in order to

[191] *Image 75* shows the tomb and its decomposed contents upon discovery. *Image 76* shows Ahmed Youssef from the Cairo Museum as he is busy creating a copy (below) of the curtain box for the Boston Museum of Art from the reconstructed item (top).
[192] Silver was very rare until the Middle Kingdom, so its use in design and decoration was a true indicator of power and influence (James 1984: 185).
[193] Inlay work of faience, ivory, calcite and different coloured timber was already popular by the 6th Dynasty (Killen 1994b: 14).
[194] http://www.globalegyptianmuseum.org/record.aspx?id=15556

accommodate the 2mm thick faience inlays. The box is richly adorned with gold leaf and hieroglyphic inscriptions along with a knob in the centre of the box to lift the lid (Baker 1966: 43, Killen 1994b: 8, Stevenson-Smith 1953: 30).

Image 76: A conservation officer from the Cairo museum creates a copy (below) of the reconstructed item (top) housed in the Boston Museum of Fine Art.

Another beautiful example of Old Kingdom craftsmanship comes in the form of a flat lid box decorated with papyrus motifs, inlaid with ivory and blue faience (*Plate 82*). The item has been dated to the 5th Dynasty and originates from a site in Gebelein (Leospo 1987: 137).

A number of different box styles, including those with handles for carrying (*Image 77*), were already present during Early Dynastic times (as depicted by the wall painting from the 3rd Dynasty tomb of Hesy-Re). The illustrations are unique, as the contents of the boxes are also displayed, as if the sides of the boxes were invisible (Brovarski 1996: 137, Quibell 1913: 8, 36). Various boxes are also carried by a number of men and women, depicted on a relief carving from the mastaba of Queen Mersyankh III, including those with flat lids (Dunham & Simpson 1974: 16). Moreover, boxes and chests could have either sliding, loose or hinge operated lids, or could be left open and covered by a single sheet of flax

linen. An example of such a practice comes from the 4th Dynasty tomb of Queen Mersyankh III, daughter of Hetepheres II and prince Kawab and wife to Khafre[195].

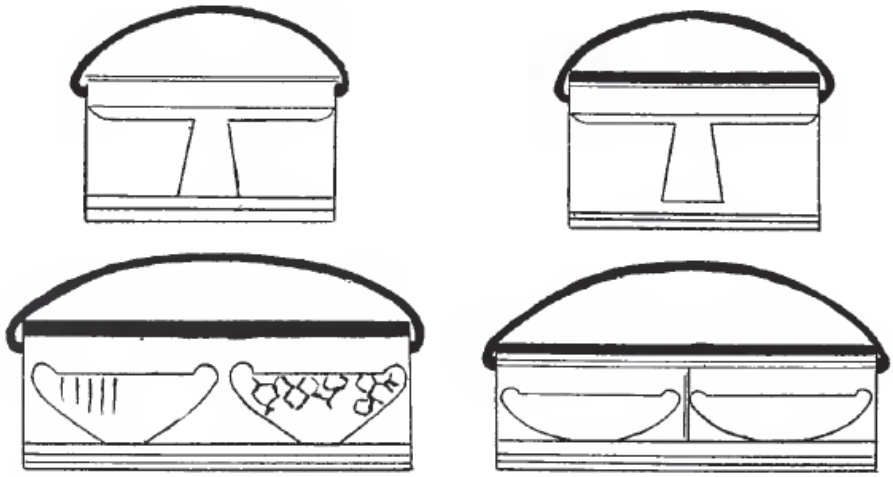

Image 77: Early Dynastic carrying boxes from the tomb of Hesy-Re.

Wall paintings from the tomb bear reference to simple rectangular boxes of various styles (*Image 78*), including those boasting rounded lids. We know from tomb art of the 6th Dynasty burial chamber of Penu at Saqqara, that box lids now also begin to take on the popular shrine and gable forms (Killen 1994a: 35, Killen 1994b: 14).

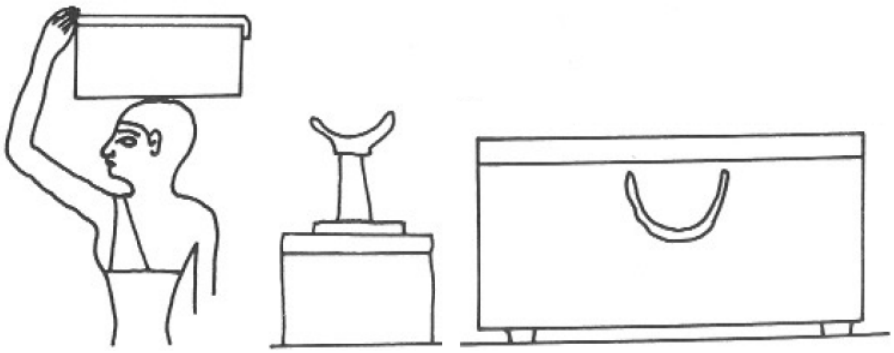

Image 78: Rectangular box from the chamber of Penu, 6th Dynasty.

Boxes, especially the heavier ones, could also be carried on support poles to ease the weight. Our two earliest examples in this regard come from the 4th Dynasty tomb of Mersyankh (Killen 1994b: 19) and the 5th Dynasty tomb of Ti (Tiye) at Saqqara (Killen

[195] http://en.wikipedia.org/wiki/Meresankh_III

1994a: 34, Killen 1994b: 11). Although the majority of boxes had no legs, or very short stubby legs (more a horizontal support plank than a leg), boxes with long vertical legs developed sometime around the 6th Dynasty. This development is demonstrated by the wall art from the tomb Niankhba at Saqqara (Killen 1994b: 13).

The cavetto Cornice[196], originally an architectural feature introduced during the 5th Dynasty (Brovarski 1996: 138), became a popular moulding style applied to boxes during the same period. These cornices are often accompanied by a Torus moulding below the edge of the cavetto curve (Killen 1994b: 17), serving as a boundary mark between the cavetto and decorative designs. The Torus moulding is a semi circular bar made of wood or plaster, affixed horizontally using either glue or pins. The style continued to be popular during the New Kingdom, and is well-represented by the boxes and shrines from the Tomb of Tutankhamun (Schaden 1984: 56) and the tomb of Nefer-Khewet and his family (Hayes 1935: 22)

Another box lid shape that became popular during the Old Kingdom is the Gable. The angles of such triangular/prism shaped lids could vary between 18 and 45 degrees, but later became set between 22 and 28 degrees during the 6th Dynasty (Killen 1994b: 19). The style was popular for linen chests and utilitarian boxes, but also featured in tomb furniture, such as canopic chests and coffins. Two examples originate from the tomb of Maket in Lahun (Kahum), and take the form of children's coffins dated to the 19th Dynasty (Hankey & Tufnell 1973: 103). Their existence indicates that the Gable lid continued its popularity from the Old to the New Kingdom

Shrine shaped boxes were already popular during the 6th Dynasty and are depicted in the tomb art from the mastaba of Mereruka (Killen 1994b: 20). The main feature of this style sees an elegant lid, which has a rounded front and tapered back (Bell 1990: 107 & 120).

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[196] The cavetto cornice is most frequently encountered as an architectural motif of false doors from tombs (Abdalla 1992: 95, Millet 1963: 161). This association may explain why cavetto cornices are frequently encountered on canopic chests. The cavetto corniced box with a flat lid also became the most popular design style during the 6th Dynasty, and is frequently depicted on the tomb walls of Seshseshet Idut, Nebkauhor Idu, Ankhmahor Sesi, Mereri, Wenu and Mereruka (Killen 1994b: 19).

6.3.14 Boxes and chests (Middle Kingdom)

Besides the more elaborate examples, boxes remained fairly simple during the Middle Kingdom. One such example (*Image 79*), from el-Lahun (Kahum) is dated to the 12th Dynasty and is constructed from straight planks. The lid has a simple rounded handle, while two similar features on the sides of the box provide a fixture from which ropes would be tied up and over the lid in order to keep it in place (Killen 1994b : 12). Two almost identical boxes (*Plate 83*) have also been dated to the Middle Kingdom. One of the boxes still contains remnants of the original rope used to secure the lid to the box.

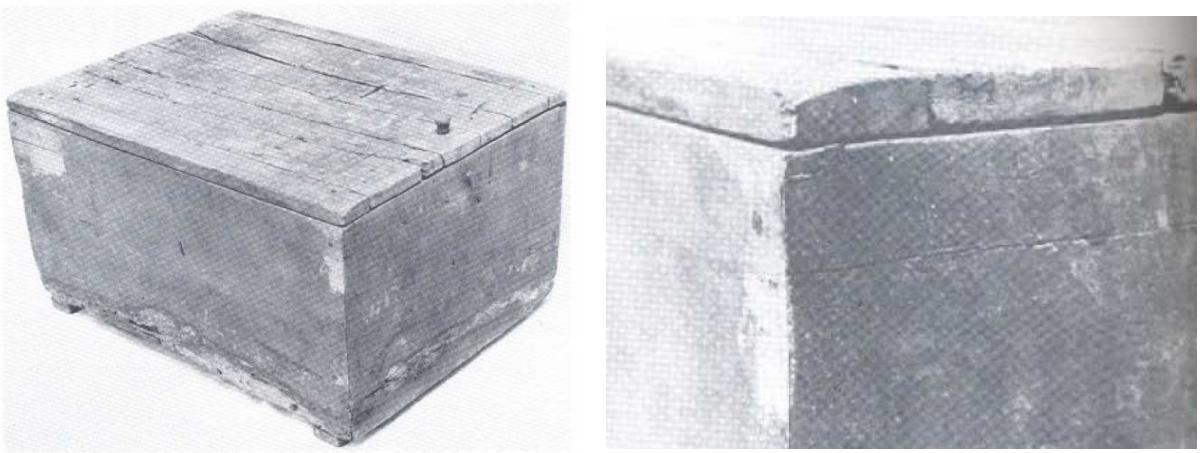

Image 79: Simple box from el-Lahun, Middle Kingdom.

A separate box lid (*Plate 83*) similar to the one described above, was also recovered from el-Lahun and boasts a total of eight dowel holes. These holes in the lid of a box would indicate that the planks were fastened to an underlying structure, often referred to as a batten. The side panels and lid of a similar box from el-Lahun (and perhaps even the remaining segments belonging to the above-mentioned lid) also contain dowel holes, suggesting that this was the most effective means of constructing simple boxes. A final

example (*Plate 84*) from the site follows a similar structural design, and was covered with a thick layer of white gesso[197].

More complex styles were created for the upper classes and royalty. One such example takes the form of a shrine shaped jewellery box from the tomb of Princess Sithathoryunet (Sit-Hathor-int), 12th Dynasty, el-Lahun (*Plate 85*). The box is made out of Sudanese ebony (Baker 1966: 148) and the feet are accentuated by golden bands. The side panels are decorated with strips of ivory, inlaid with golden djed pillars and light blue faience strips. These motifs are found within vertical patricians believed to represent false doors. The lid itself has cavetto cornice edges and is topped by the traditional shrine shaped lid. The lid was also lavishly decorated with four golden Hathor heads, each one topped with a polished carnelian sun disk, encircled with fine silver inlays and golden horns[198] (Baker 1966: 148, Killen 1994b: 23). In addition we also have the cosmetics box of Sithathoryunet (*Plate 85*), which incorporates the same false door motif as decorations. The box is also made of ebony, inlaid with strips of ivory, but the lid is markedly different. Instead of the shrine shape lid, which bulges more towards the front of the lid, this example features a lid that bulges in the centre. The placement of the lid handle is also different, as the knob is positioned on the apex of the lid, instead of the front[199] (Mace 1920: 153-155).

Next we have the toiletry box[200] (*Plate 86*) of Kemni, from the tomb Rensomb in Thebes, dated to the reign of Amenemhat IV (12th Dynasty). This fairly simple rectangular has a drawer containing circular cups[201] in which the owner could place various toiletry objects (such as small oil vases). The box itself is made of ebony and is decorated with thin strips of ivory veneer. The front panel is decorated with an ivory strip, displaying a carved

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[197] This thick layer could be used to cover inferior quality wood, or it could also be used as a base/primer upon which hieroglyphics (and other decorations) would be painted. This practice of painting hieroglyphics onto items originates from the Old Kingdom, and is visible in the 3rd Dynasty tomb of of Hesy-Re as well as the 5th Dynasty tomb of Kaemrehu at Saqqara (Killen 1994b: 13).

[198] http://www.metmuseum.org/works_of_art/collection_database/egyptian_art/jewelry_chest_of_sithathoryunet/objectview.aspx?page=403&sort=0&sortdir=asc&keyword=&fp=401&dd1=10&dd2=0&vw=1&collID=10&OID=100002008&vT=1&hi=0&ov=0

[199] http://www.metmuseum.org/works_of_art/collection_database/egyptian_art/inlaid_box_for_cosmetic_vessels_of_sithathoryunet/objectview.aspx?page=403&sort=0&sortdir=asc&keyword=&fp=401&dd1=10&dd2=0&vw=1&collID=10&OID=100002010&vT=1&hi=0&ov=0

[200] *Plate 86:* The toiletry box of Kemni (left) and that of Nebhepetre (right).

[201] During the Middle Kingdom the larger majority of toiletry boxes were designed to hold eight vases (Killen 1994b: 28).

motif of the god Amun, and has a simple handle with which to open the drawer (Baker 1966: 147, Killen 1994b: 26, Killen 2001: 585, Lythgoe 1927: 32, Scott 1965: 147).

The next item originates from the 11th Dynasty and is a very good example of how simple the design of a sliding lid was. The item (*Plate 86*) is a cosmetics box from the temple of Nebhepetre in Deir el-Bahri, and dates from the reign of Mentuhotep II. The frame of the box is in a simple rectangular shape, and the planks are joined together by aid of wooden dowels. The lid is flat and has carved tenons (at the one side), that fit neatly into a lip carved into both side panels of the box. The side panels, and back panel, are flush with the top of the lid, preventing it from moving either backwards or sideways. The front panel is lower and meets up with the bottom side of the lid. A simple handle, consisting of a horizontal strip of wood (glued or pinned to the lid) topped by a rounded knob, allows the user to gently slide the lid open in the direction of the front panel. The underside of the handle is flush with both the lid and the side panels, thus keeping the lid firmly in position. The item is not very large, but bigger boxes and chests with sliding lids would have been designed in a similar fashion[202].

Our next example (*Image 80*) dates from the 12th Dynasty and was, according to the museum database, an anonymous gift that may have its origins in Lebanon[203]. Although the lid hinge may not be visible as seen from the angle of the photo, the positioning of the handle suggests that the lid was lifted from one side, thereby relying on the support provided by a hinge mechanism on the opposite end. Judging from the visible front panel, it appears that the box was left undecorated, but we cannot be sure from just the museum image. Whatever the case may be, the front panel is cleverly designed in that it appears to be a drawer (complete with its own handle). The slight gaps between the horizontal panels create the illusion of a drawer, but the presence of a lid indicates that the knob on the front panel (and possibly the back panel) was used to affix the lid to the box using ropes.

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[202] http://www.metmuseum.org/works_of_art/collection_database/egyptian_art/objectview.aspx?page=822&sort=0&sortdir=asc&keyword=&fp=821&dd1=10&dd2=0&vw=1&collID=10&OID=100014542&vT=1&hi=0&ov=0

[203] http://www.metmuseum.org/works_of_art/collection_database/egyptian_art/objectview.aspx?page=940&sort=0&sortdir=asc&keyword=&fp=936&dd1=10&dd2=0&vw=1&collID=10&OID=100014382&vT=1&hi=0&ov=0

Image 80: 12th Dynasty box

Aside from the popular structural designs, there were also popular decorative designs. An example (*Plate 87*) of such a design is seen in a cosmetics chest from Kubaniya, Aswan area, dated to the 12th Dynasty. The box itself is fairly simple and is made of a relatively soft wood. The lid is slightly rounded and the box rests on four short legs. The majority of the box surface is covered with thin panels of ornate ivory, decorated with carved concentric circles. The panels are fastened to the box using a series of metal pins. According to the museum database[204] the decorative style had its origin in Nubia. In addition we have two more items from the Middle Kingdom boasting the same decorations.

In this regard our next example (*Plate 87*) not only demonstrates the continuation of this decorative style, but also presents us with a unique double sliding lid design. The box is dated to the late Middle Kingdom and was recovered from Lahun[205]. The top of the box features two sliding lids manufactured in the same method as discussed under *Plate 51*. The handle of the lid follows on the design mentioned above, but is this time created out of a strip of decorated ivory instead of a horizontal length of wood. The front and back panels

[204] http://www.globalegyptianmuseum.org/record.aspx?id=5404
[205] http://www.digitalegypt.ucl.ac.uk/lahun/town/furniture.html

have two knobs/handles each, ensuring that both lids could be fastened using the tied rope method. The remainder of the box is left undecorated, relying on the colour of the wood to give the desired effect. The slender legs form the corner piece to which the side panels would have been doweled in place. In addition we also have the remainder of a much larger box/chest[206], of which only the lid has survived (*Plate 87*). The lid is rounded and large, bulky dowels are visible (which would have served to keep the rounded wood of the upper part of the lid attached to a flat base). The lid is framed by lengths of decorated ivory with five similar strips in between. Gaps are left between the five strips in order to give a contrasting effect with the dark colour of the underlying wood. Instead of metal pins, wooden dowels are used to affix the ivory strips to the underlying wood. This decorative motif continued to be popular, even during the age of the Black Pharaohs.

Another example (*Plate 88*) of the double sliding lid comes from the temple of Nebhepetre Mentuhotep in Deir el-Bahri, and has been dated to the 11th Dynasty[207]. The rectangular box is quite simple design and rests on two horizontal slats of wood that form the feet. The sliding mechanism is based on the same principles as discussed above, but this time the lids open in different directions (one to the front and the other to the side). The box has no decorations, save for the band of black paint applied around the top edge of the item. Overall, sliding lids continued to be popular throughout Egypt's history.

From the 2nd Intermediate Period we have a simple rectangular box (*Plate 88*) originating from tomb C24 from Deir el-Bahri[208]. The box is completely undecorated, except for the interchanging colour of the wood used for its construction. Once again the dowels used to strengthen the joints are clearly visible, as are the knobs/handles that would have been used to secure the lid.

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[206] http://www.metmuseum.org/works_of_art/collection_database/egyptian_art/objectview.aspx?page=736&sort=0&sortdir=asc&keyword=&fp=736&dd1=10&dd2=0&vw=1&collID=10&OID=100014397&vT=1&hi=0&ov=0

[207] http://www.metmuseum.org/works_of_art/collection_database/egyptian_art/jewelry_box/objectview_enlarge.aspx?page=721&sort=0&sortdir=asc&keyword=&fp=721&dd1=10&dd2=0&vw=1&collID=10&OID=100001741&vT=1&hi=0&ov=0

[208] http://www.metmuseum.org/works_of_art/collection_database/egyptian_art/objectview.aspx?page=305&sort=0&sortdir=asc&keyword=&fp=301&dd1=10&dd2=0&vw=1&collID=10&OID=100009888&vT=1&hi=0&ov=0

6.3.15 Boxes and chests (New Kingdom)

Although the New Kingdom was known for its highly advanced carpentry skills, and creations of imported woods and fine materials, the ancient Egyptians (especially commoners) of this period still relied heavily on furniture items created from reeds and papyrus. Our first example (*Image 81*) comes from the 18th Dynasty and is rectangular in shape. The inner frame is constructed of thick reeds, while the outside panels are made of papyrus 'mats'. The internal structure is given strength by the principle of triangulation and is further supported by horizontal beams placed over the diagonal and vertical reeds. The frame is strengthened by papyrus strips that are wound tightly around the joints. The papyrus panels are tied to the reed frame by weaving the panels onto the supports with thin strips of papyrus (Killen 1994b: 30).

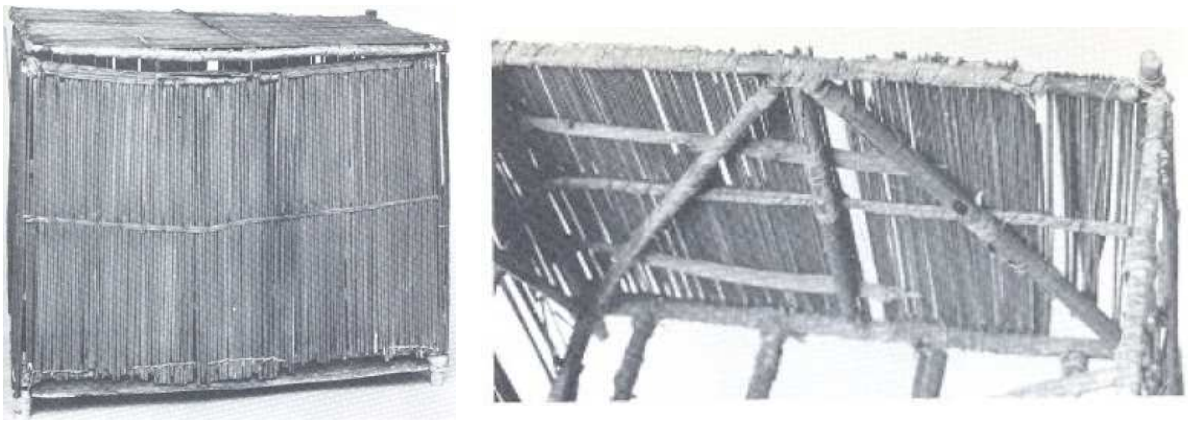

Image 81: Reed and papyrus box, 18th Dynasty

A similar construction (*Image 82*) comes from the tomb of Tuya and Yuya, and has been classified as a wig box (Baker 1966: 69, Killen 1994a: 11, Killen 199b: 30, Quibell 1908: 57-58).

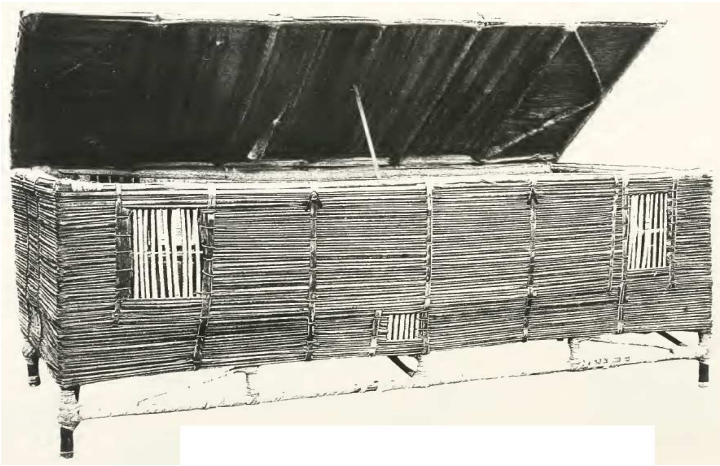

Image 82: The wig box of Tuya and Yuya.

In contrast to these plain reed and papyrus boxes, we have a multiplicity of ornate wooden boxes from throughout the Kingdom. Jewellery and cosmetics boxes, which were considerably smaller in size when compared to linen chests and curtain boxes, were perhaps more affordable, and thus appear more frequently in the graves of lower ranking officials. Yet highly ornate boxes used by royalty can tell us more about the different styles, designs and imported materials that characterised the New Kingdom. Our first example (*Image 83*) in this instance is a rectangular jewellery box from the 18th Dynasty, which is carefully decorated with strips of lightly coloured wood, ebony and pink stained ivory (James 1984: 192). Upon closer investigation one will notice that these decorations are not inlays but rather thin strips of veneer. As with *Plate 87*, the legs also function as the supports to which the side panels are doweled, while a chunky plaster is used (as a wood filler) to cover some of the gaps between the jointed sections (Killen 1994a: 53, Killen 1994b: 34).

Image 83: Rectangular jewellery box, 18th Dynasty.

The following two items represent the continued use of sliding lids during the New Kingdom. Both are basic in their design and feature elaborate decorations. The first box (*Image 84*) is decorated by interchanging strips of timber and bone on the side panels and lid, and feature roughly carved knobs/handles to tie down the lid. The second box is similar to the first, but has been left undecorated.

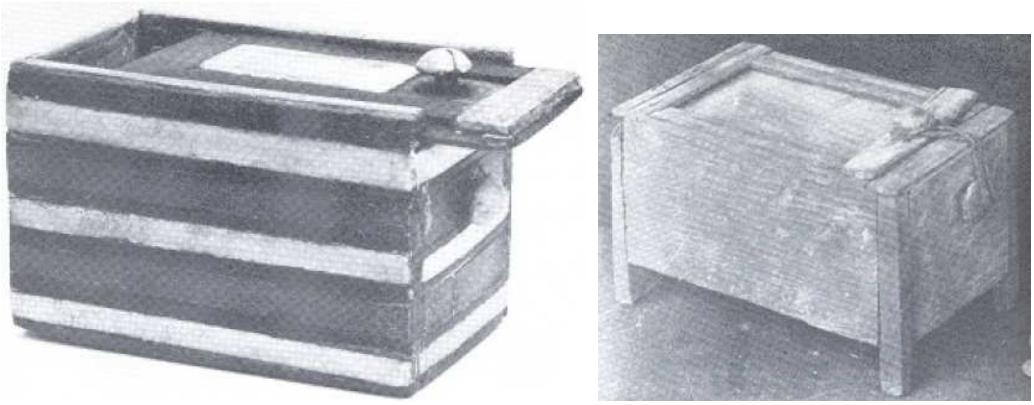

Image 84: Simple boxes with sliding lids.

Not only stools and chairs, but also boxes could have lattice work between the legs. In the case of stools and chairs, this addition would serve a dual function of supporting the structure physically, while also providing decoration. Yet in the case of the following item (*Image 85*) the lattice work is purely decorative. Aside from the lattice work, the item is fairly plain, and boasts relatively large knobs/handles for tying down the lid. The inside is divided into four compartments (a common feature of toiletry boxes), which would have served to keep the various items separate. This toiletry box originates from the tomb of Any (1300 BC) and belonged to his wife Tutu (Killen 1994a: 52).

Image 85: Box with toilet box of Ani.

Painted boxes were also very popular during all periods of ancient Egyptian history. These boxes were covered with a thin layer of wood after which paint would be applied (*Image 86*). In the case of the second box we also have an example of a shrine shaped lid. Both items have been dated to the 18th Dynasty and are currently housed in the Louvre Museum in Paris (Killen 1994b: 35-37).

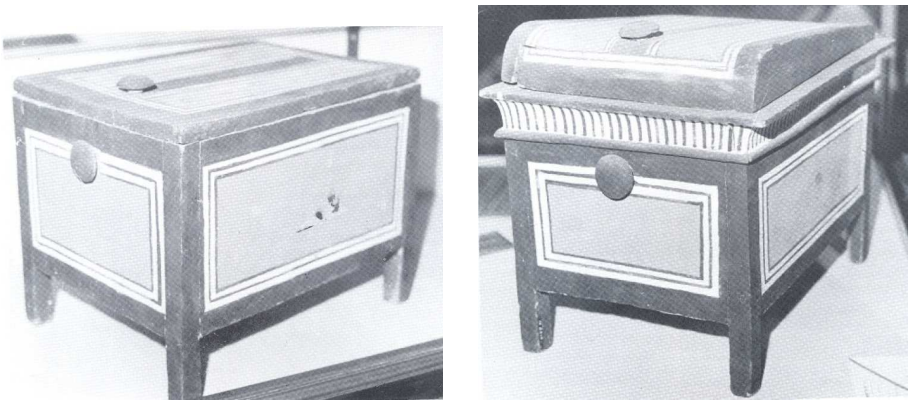

Image 86: Painted boxes. One (right) boasts a shrine shaped lid.

Several of the most beautiful pieces of furniture from the New Kingdom originate from the tomb of Perpaut, 18th Dynasty (*Plate 89*). The first is a highly decorated box with a pent roof resting on gabled ends. The entire item is covered in a thin gesso, which serves as a base for the colourful paint. Diamond shaped geometric patterns decorate the legs; the images on the front, back and side panels are encircled by a frame of three black lines against a white backdrop. Black lines also round off the gabled ends of the box lid, while the triangular shape itself is painted a dark yellow. The two sloping sides of the lid are decorated by interchanging red and black zigzag lines that run parallel to the front of the box. The side and back panels are decorated by scenes of gazelle feeding on the leaves of exotic trees and lotus flowers, while the front panel seen Perpaut and his wife Weri seated by an offering table. What truly makes the item unique is the intricate locking mechanism used to close the box, thus securing the contents (Killen 1994a: 50, Killen 1994b: 38-40).

The second box (*Image 87*) from the tomb is smaller and less ornate but follows the same basic structural shape, while the third box is equally ornate when compared to the

first. Most importantly, the items exhibit a new structural design which is quite unique. Both examples see a change in construction, as the triangular gables are now incorporated into the side panels. The lid is designed so that it rests securely against the opposite lid, while handles allow the user to lift the lid. This pivoting action is facilitated by the combined use of a rounded lower edge and the ingenious use of dowels as axles (Killen 1994a: 51, Killen 1994b: 42).

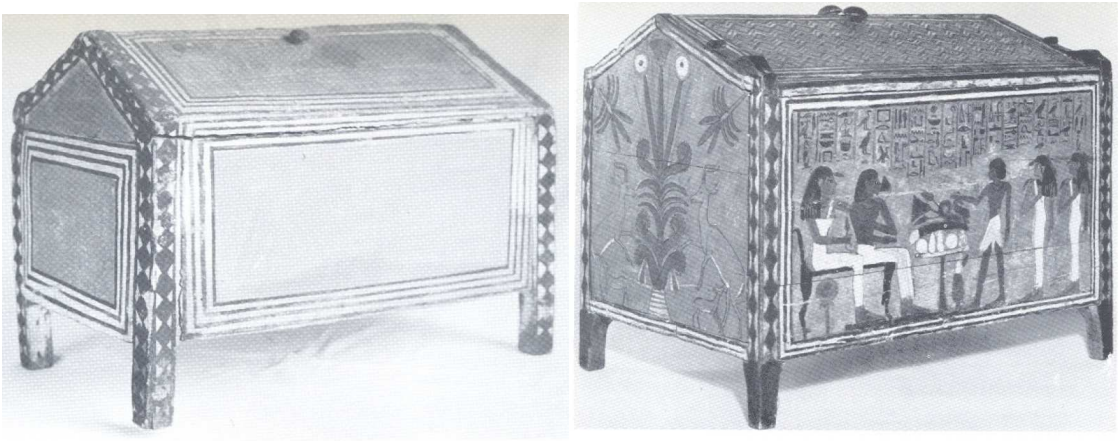

Image 87: Two boxes from the tomb of Perpaut, 18th Dynasty.

Three similar boxes originate from the Kha collection and have also been dated to the 18th Dynasty. Both examples (*Image 88 & Plate 90*) feature gabled lids. The first example is a plain white gesso covered box, with a single vertical band containing hieroglyphic writing. The second is more ornate and boasts an intricate mixture of geometric and floral designs. The third example combines the floral-geometric style with an offering scene on the front panel. The scene shows Kha and his wife Meryt receiving gifts brought to them by their son Nakht (Baker 1966: 119, Killen 1994b: 44-45, Leospo 1987: 151). The fourth is a brightly coloured yellow box with floral motifs on the lid and checker board designs on the side panels (Baker 1966: 145).

Image 88: Boxes from the tomb of Kha, 18th Dynasty.

Once again the Tutankhamun collection[209] provides us with the most detailed and elegant examples of Egyptian craftsmanship encountered thus far. Our first example (*Plate 91*) is a carrying chest similar to the ones described in the Old Kingdom section. The true value of this item is that it is the only surviving item of its kind (Killen 1994b: 51). The framework of the box is made of ebony, while the lid and box panels boast complementary cedar inserts. The contrast between the dark brown and red colours of the wood is further enhanced by the strips of ivory that frame the cedar panels. The lid is gabled and follows the overall shape encountered in the collections of Perpaut and Kha. The knobs/handles are gold-plated and contain hieroglyphic inscriptions while the accompanying hieroglyphic text on the box itself is a gold colour. The feet are capped in bronze, protecting the underlying wood from damage, while the carrying poles are slid cleverly into a guiding system of timber strips and bronze staples (Baker 1966: 95, Desroches-Noblecourt 1972: 136-136, Hawass & Garret 2005: 239, Killen 1980: 52-53).

One of our finest examples (*Plate 92*) of Egyptian paintwork also originates from the tomb of Tutankhamun. The rectangular box stands on four simple legs but is crowned by a skilfully crafted rounded lid. Upon closer examination one finds that the lid is made of carved panels, which are secured to rounded end supports. The rounded knobs/handles on the

[209] The Tutankhamun collection of boxes and chests is so vast that it could actually occupy its own section in this dissertation.

side panels and top of the box indicate that the standard rope tied method still prevailed over complex locking mechanisms. The entire box is covered in a thick layer of gesso, allowing the paint to adhere smoothly to the surface. The decoration on the lid sees the boy king partaking in a lion hunt, while the front panels depict him crushing Nubian enemies beneath his chariot. In both scenes the young Pharaoh is protected by the vultures of Nekhbet, while soldiers and hunters bring up the rear. The back panel illustration is less well known and shows two sphinxes crushing the enemies of Egypt[210] (Baker 1966: 93, Desroches-Noblecourt 1972: VI, Killen 1994b: 53-54).

The next two boxes are almost identical and follow a similar physical structure to the boxes mentioned above. Both items are covered in a thick layer of white gesso, and have been left undecorated. The first item (*Image 89*) is a plain white box with a rounded lid and four straight legs. The second box is almost identical, but the box frame, legs and lid edges have been painted black. The side panels carry hieroglyphic inscriptions below the handle and both items would once again have been closed using the tied rope method (Killen 1994b: 55).

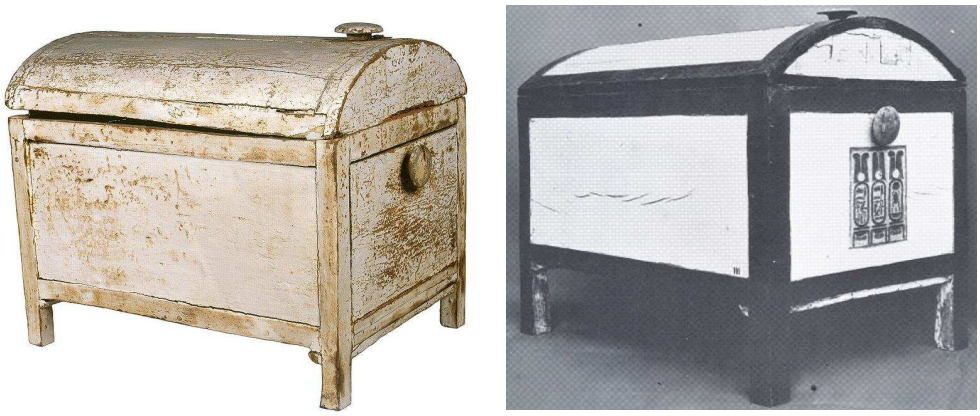

Image 89: Two similar white washed boxes with rounded lids.

The next example (*Plate 93*) also features a rounded lid, but features inlay work instead of gesso and paint. The underlying wood is of inferior quality, but the ancient carpenter made up for this by covering the wood with inlays of ivory, ebony and other coloured wood. The marquetry on the lid of the box is even finer, and covers the entire surface. Both techniques

[210] Very few resources ever refer to the back panel of the box. The only image that I could locate is slightly unclear.

are so well executed that the only hint towards the inferiority of the wood is encountered on the inside of the box[211] (Baker 1966: 98, Killen 1994b: 59).

Only three boxes from the tomb were created with long vertical legs. The first item (*Image 90*) is fairly plain in that the only decoration on the box appears in the form of bronze caps/shoes around the feet and ivory handles. The second item follows the same structure, but this time features golden framework on the front, back and side panels. Both items feature lattice work below the box itself, serving both a structural and decorative role.

Image 90: Tall box with long vertical legs.

The third item[212] (*Image 91*) is more exquisite and boasts golden ankh and *was* sceptre mouldings instead of lattice work. Golden hieroglyphic inlays also frame all four outer panels of the box. In all three instances, the lids open on a hinge mechanism to reveal a secondary or inside lid. This inside lid divides the inner compartment into two, and allows the inner lid to be used as a tray (Baker 1966: 92, Hawass & Garret 2005: 245, Killen 1994b: 60).

[211] http://www.globalegyptianmuseum.org/record.aspx?id=15549
[212] *Plate 94:* A similar item to Images 90 & 91.

Image 91: Tall box with golden ankh designs.

The box seen in *Image 92* is a rectangular jewellery box made of cedar panels edged with ebony. The inside of the box is divided into dual compartments to store different items. The outside of the box is decorated with fine marquetry work of silver, ebony and ivory strips, laid out in a herringbone pattern. The pattern is formed from interchanging thin strips of material, estimated to range in the thousands. A combination of glue and gold capped ivory pins are used to secure the decorative ivory frame around the inlaid sections. On the front panel, just below the handle, is an ivory plaque with the Pharaoh's Nebkheperure cartouche (Baker 1966: 94, Killen 1994b: 64).

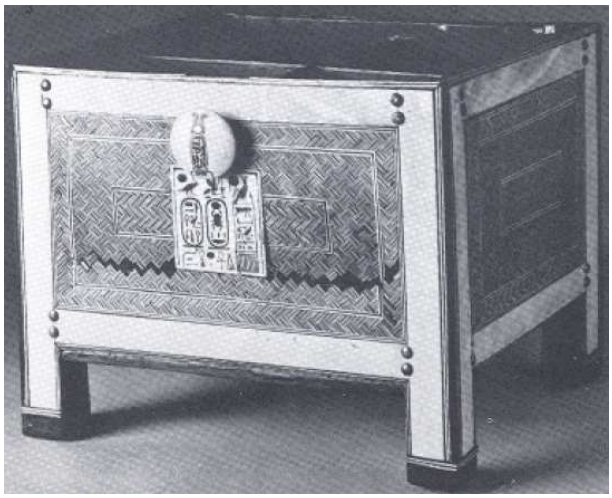

Image 92: Rectangular jewellery box with cedar panels.

The ivory jewellery box of Tutankhamun (*Plate 95*) is made entirely of ivory panels and strips. The front of the box depicts the kings name in a low relief carving, while the back displays a decorative column and lotus motif. The lid flips open by means of a pin and ring hinge. The feet are capped with gold shoes and both handles are cast from solid gold[213] (Killen 1994b: 64).

The next box (*Plate 95*) is perhaps one of the more well-known boxes from the tomb. The box is made from a relatively soft wood and stands on four short legs capped with silver shoes. The decorations are positioned in such a way that the box panels are divided into two rectangular horizontal sections by elongated ivory strips. The lid is divided by the same means into six sections. Each one of these sections is decorated by golden fretwork symbols in the shape of ankhs and *was* sceptres resting on a *neb* (the sign for gold[214]). The horizontal and vertical ivory strips that form the framework are inscribed with black hieroglyphics (Baker 1966: 93, Blakemore 2006: 23). The underlying wood has been left untreated and provides the perfect dark backdrop to accentuate the gold and ivory (Killen 1994b: 66). Nothing specific is mentioned about the knobs/handles, but it appears they were constructed of wood and painted a dark orange colour.

The last example is a plain white toiletry box (*Plate 95*) standing on four short legs. The legs have been left without metal sheaths, leaving the wood to stand unprotected on the floor. The lid of the item swings open by means of a simple timber pivot doweled into curved bars, which cap the two side panels. The inside of the box features two compartments, each of which boasts its own swivel lid (with the pivots doweled into the side panels) and miniature ebony handle. The interior of the box contains razor housings (specially designed slits cut into a solid piece of timber), indicating that the item was indeed a toiletry box[215] (Killen 1994b: 66).

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[213] http://www.globalegyptianmuseum.org/record.aspx?id=15544
[214] http://www.globalegyptianmuseum.org/record.aspx?id=15543
[215] http://www.globalegyptianmuseum.org/record.aspx?id=15637

From the tomb we also have a number of shrine shaped boxes. The first example (*Plate 96*) is constructed from a light red wood and embellished with beautiful inlays. Strips of ivory form an outer frame, followed by a secondary frame of interchanging strips of ivory, ebony and red wood. A third inner frame consists of a calcite and faience frieze depicting lilies and other floral motifs, which is combined (on the side panels) with a geometric design featuring triangular ebony and ivory inlays. The decorative scene in the middle is rounded off by thin strips of ivory, which help to accentuate the main motif. The lid handle is placed on the rounded curve of the shrine shaped lid, while a cavetto cornice design forms a defined ledge between the box frame and the lid[216] (Baker 1966: 95, Killen 1994b: 71-72).

The second example (*Plate 96*) is similar in construction but is decorated in a different style. The entire box is gilded and features dark blue, orange and green faience and polished glass inlays. The lid is decorated with two identical inscriptions, while the side panels depict uraeus cobras with sun disks above their heads, forming cartouches with their tails. Both sides of the sloping lid also follow the royal cobra motif, this time depicting a single winged snake with its body curving down the length of the lid panel. The front panel depicts the Pharaoh alongside two *heh* figures underneath a dark blue faience handle. On the side panels we encounter bronze staples (or hoops) that would have accommodated carrying poles, allowing the box to be carried in tandem along with other boxes[217] (Killen 1994b: 74).

Besides the boxes already mentioned we also encounter a simple light coloured box with a gabled lid (*Image 93*), similar in structural design to the ones discussed above. This particular box provides us with examples of the use of torus mouldings (often made out of gesso, but in this instance made out of timber strips) and rough plaster (used as a wood filler). Along with this item, another three gabled boxes were recovered from the tomb (Killen 1994b: 75).

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[216] http://www.globalegyptianmuseum.org/record.aspx?id=15261
[217] http://www.globalegyptianmuseum.org/record.aspx?id=15520

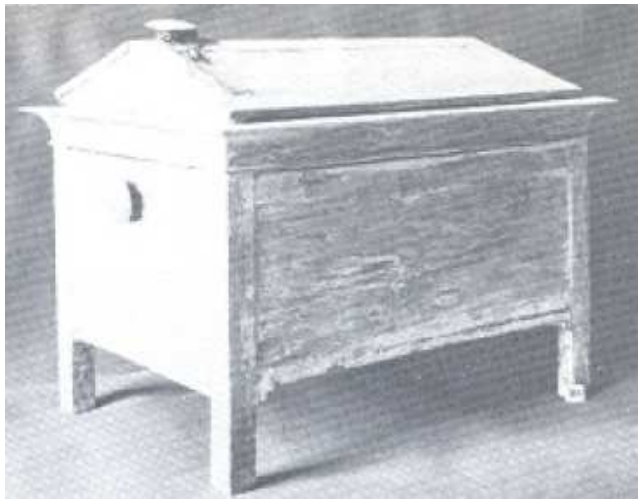

Image 93: Light coloured box with gilded lid.

In addition, we also find a very interesting box type that required considerable skill from the carpenter: the cartouche shaped box (*Image 94*). Instead of the rounded corners being made of bent strips of wood, the feature is carved from a solid, radiused piece of wood and slots into the straight panels at a mitred angle. The entire frame of the box has been made from Redwood and is overlaid with ebony veneer in certain sections. The front panel of the item forms the 'base' of the cartouche, and almost resembles a drawer. The lid is embellished with ebony and ivory inlays spelling the king's name in hieroglyphics. These hieroglyphics are not inlaid directly into the wood, but rather into a skilfully gilded gesso base. The sides of the box are decorated with stained ivory and ebony veneers boasting three horizontal bands of hieroglyphic inscriptions (Baker 1966: 98, Killen 1994b: 76).

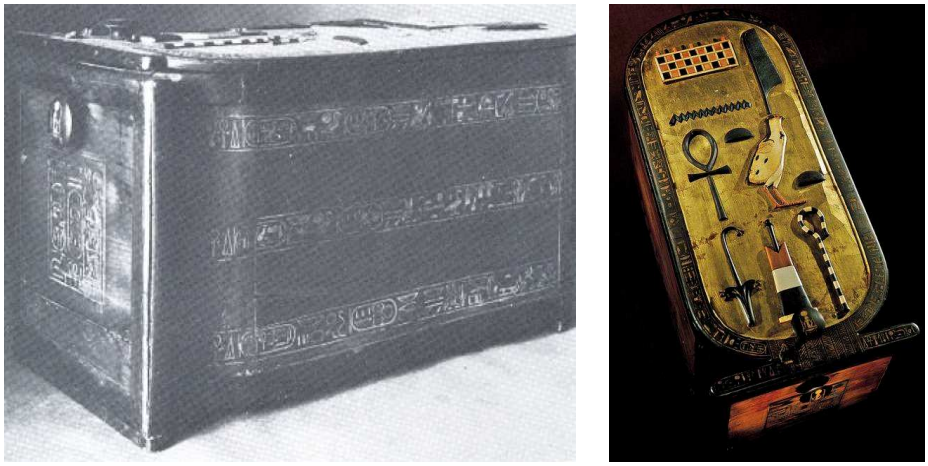

Image 94: Cartouche shaped box.

Another interesting box shape is the ‘cut-off cartouche’ style (*Image 95*). The item has the rounded edge of the cartouche box, but is cut off just as the curved edge becomes straight. The curved side represents the front of the box, while the back is represented by a flat panel. The box rests on three extremely short little legs, with the third situated in the middle of the curved side to create balance. The outside of the box is covered in thin strips of ebony veneer, which is complemented by leaves of reddish timber (all affixed using a dark resin). The front of the box exhibits the King and Queen’s names written in yellow paint beneath the ebony handle. Four bent metal rings are clearly visible and would have been used to transport the box using carrying poles (Killen 1994b: 77).

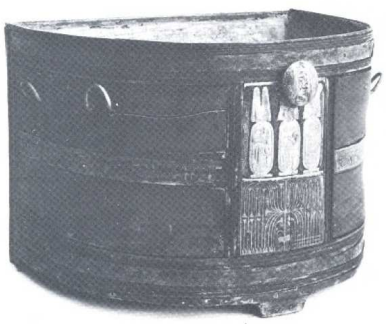

Image 95: The “cut-off cartouche” style.

Returning now to a more simple design we have the wig box of Tutankhamun (*Image 96*). The item is higher than it is wide, forming an upward rectangle supported on four straight legs. The wig box is very dark in colour and appears to be ebony, yet upon closer investigation one can identify a light coloured wood emerging from a layer of dark resin. This hidden characteristic is particularly evident from the scuffed leg corners. The item boasts simple decorations in the form of interchanging gold, green feldspar, lapis lazuli and red carnelian inlays ordered in horizontal and vertical lines. The only true ebony insert on the box may be the front handle, where the dark brown wood appears to be the natural colour. The feature identifying it as a wig box is visible in the interior of the item. A cylindrical pole is slotted vertically into a circular base on the bottom of the box, and is capped by a dome-shaped wig support.

Image 96: Tutankhamun's wig box.

Also recovered from the tomb was a simple utilitarian rectangular box (*Plate 97*). As with other flat topped boxes, this one features knobs/handles by which the lid would have been secured using ropes. The uniqueness of the box lies with its variation in wood type. The front, back and side panels are of a lovely red wood while the frame and legs are of a dark brown wood. The frame of the lid is made of the same dark brown wood while the panel itself is made of a much lighter wood[218].

Although no bed canopy was recovered from the tomb, these items probably remained popular throughout Egypt's history, as individuals would always have desired a private space for their sleeping quarters. The long rectangular box from Tutanhkamun's tomb may have been used as a linen box (*Plate 98*), but the longitudinal shape would also have allowed for the storage of curtains. The box stands on four middle length legs, capped with bronze shoes and supported by lattice work. The legs and frame are made of a dark brown wood while the inside panels are coloured white by a thick layer of gesso. Because of its length, the box has a dual tie down system, consisting of two knobs/handles on the lid and two on the front panel (Baker 1966:94). The only visible decoration takes the form of gold painted hieroglyphics on all four of the knobs/handles[219].

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[218] http://www.globalegyptianmuseum.org/record.aspx?id=15578
[219] http://www.globalegyptianmuseum.org/record.aspx?id=15637

Our final item from the Tutankhamun collection is a rectangular jewellery box made from reeds and papyrus (*Plate 99*). Although this item may not seem fit for royalty upon first glance, one must keep in mind that the papyrus and reeds would have deteriorated considerably over the ages. The front panel and lid are decorated with fine ebony and wood veneer inlay work that has been glued onto the papyrus and secured in place by thin wooden strips[220] (Baker 1966: 99).

With our discussion on the Tutankhamun collection representing the artistic apex of the New Kingdom, we now turn to a last few items from the 19th Dynasty. The first example originates from Tanis in the governorate of Sharqiya in Lower Egypt. The box is made of thin pieces of wood and covered in a thick layer of gesso. The entire item is painted in a mustard yellow colour (*Plate 100*), and the inscription on the front panel names the original owner as 'the Lady Isis'[221].

A unique example (*Plate 101*) comes from the 19th Dynasty tomb of Senedjem (an official who lived during the reign of Rameses II). This box was intended for cosmetics, and opens by mean of a simple pivot mechanism. The box is covered in thick gesso and appears to be inlaid with dark wood, yet upon closer investigation the designs reveal themselves to be painted replicas. The brushwork is so precise, it allows the creator of the item to replicate the more expensive original inlays of the time[222] (Baker 1966: 145).

Our second last item (*Plate 101*) has been dated to the 18th Dynasty. Although the construction differs slightly from the sliding boxes discussed earlier, the item shows that these utilitarian box types were still popular later in Egypt's history. The box is made of thin layers of inferior quality wood, but the quality of the external inlay work makes up for the undesirable appearance of the underlying wood. The entire external surface (save for the

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[220] http://www.globalegyptianmuseum.org/record.aspx?id=15552
[221] http://www.globalegyptianmuseum.org/record.aspx?id=15727
[222] http://www.metmuseum.org/works_of_art/collection_database/egyptian_art/cosmetic_box_from_the_tomb_of_sennedjem/objectview.aspx?page=1&sort=0&sortdir=asc&keyword=&fp=1&dd1=10&dd2=0&vw=1&collID=10&OID=100001027&vT=1&hi=0&ov=0

bottom) is covered in a checker board design made from interchanging tiles of ebony and ivory, framed by thin strips of ivory[223].

Our last example (*Plate 102*) illustrates the continuation of a popular decorative motif developed in the Old Kingdom. This plain wooden box has been left untreated, highlighting the natural colour and grain of the wood. The only embellishment takes the form of ivory strips, decorated with the circle design discussed earlier. The two holes flanking the knob/handle on the front panel suggests that the box has an internal lid or shelf, used to keep various items separate inside the box[224].

6.3.16 Tables (All periods)

The table is perhaps the one furniture item that never saw wide scale use in the everyday households of ancient Egypt, yet its frequent depiction in tomb art (Blakemore 2006: 21), suggests that royalty and the upper classes made more frequent use of these items.

Our first examples appear in 3rd Dynasty tomb painting (Leospo 1982: 100), but it is suggested that wooden tables were only produced on a larger scale during the 5th Dynasty, shortly after the development of the pull-saw (Killen 1994b: 65). The relatively late introduction of this utilitarian item may have influenced the tradition of using tables as everyday items, but it is more plausible to assume that tables were ignored by members of the general public because very few people owned the furniture (stool or chair) required to sit at one. Yet, despite the existence of low tables, positioned only a few centimetres off the ground, the trend did not catch on, as people were perhaps unwilling to pay a large amount of money for something that was not seen as essential. Moreover, the common practice

[223] http://www.mfa.org/collections/search_art.asp?recview=true&id=164505&coll_keywords=furniture&coll_accession=&coll_name=&coll_artist=&coll_place=&coll_medium=&coll_culture=&coll_classification=&coll_credit=&coll_provenance=&coll_location=&coll_has_images=&coll_on_view=&coll_sort=0&coll_sort_order=0&coll_view=0&coll_package=0&coll_start=2151

[224] http://www.metmuseum.org/works_of_art/collection_database/egyptian_art/objectview.aspx?page=727&sort=0&sortdir=asc&keyword=&fp=726&dd1=10&dd2=0&vw=1&collID=10&OID=100012188&vT=1&hi=0&ov=0

was still to wine and dine at one's leisure on the floor, sitting either on a woven mat, or reclining against a bundle of rolled up clothes or linen.

The first tables were merely planks (*Image 97*) with short stubby legs. We have three basic tables (resembling those of modern times) available for our discussion; the table of Kha, a table[225] from Drah abu'l Negga, Thebes, and another from an undisclosed location. All three examples are of a basic construction and made of readily available wood. Simple variations in design did exist, as is evident from the cavetto cornice mouldings seen on both. The tables were left undecorated, and the legs were never carved in thereomorphic shapes[226] (Baker 1966: 117, Killen 1980: 65-66, Killen 1994a: 26-27).

Image 97: The evolution of the table.

[225] The table boasts cavetto cornices linking the table top to the frame.
[226] Unless we have simply not discovered such models yet.

More commonly, the ancient Egyptian made use of simple reed tables, fastened together with papyrus strands (Baker 1966: 117). Although these tables appear quite flimsy, one must remember that they were not intended to hold a lot of weight, as only flat breads, fruits and other edibles were placed on these tables, while jugs of wine or water would have been placed on the floor, or on stronger stands.

The innovation of the Egyptian carpenter's mind is evident in one exceptional example (*Image 98*). This case suggests that that no large timber blocks were available from which to carve a solid table top. The designer of the table thus decided to make the top of round poles, securely positioned by a frame of support poles (Leospo 1987: 147). The rounded style is continued in the legs of the item and lattice braces support the legs (Baker 1966: 118, Killen 1980: 66).

Image 98: A table made from rounded lengths.

Simple rectangular tables with straight legs and sides, with solid tops and sturdy cross beams were common in the households of 18th Dynasty officials, as testified by the tables of Kha (Baker 1966: 152).

The three legged (*Image 99*) table is another example of innovation from ancient Egypt appearing only much later in history (between the early New Kingdom) and becoming widely used only during Hellenistic times. The table top is created from three rectangular

boards secured on top of two beams on each side. The construction is supported by three legs, with the third one placed in the middle of its section. The legs all curve outwards, while the structure as a whole relies heavily on the table's centre of gravity for stability. The legs are slotted into holes carved through both the table top planks and the underlying beams. The leg ends are then wedged tightly in place to secure stability (Killen 1980: 67). The name of the original owner, Pa-per-pa, is inscribed on the thick gesso covering the table top, which has lead scholars to date the table from the time of the architect Kha (Baker 1966: 153).

Image 99: The three-legged table.

Tables were also popular for a range of other functions. Although the majority of board games were played on game boxes, some games appear to have required a larger table. Our first example comes from the tomb of Mereruka (*Image 100*), while two more examples (*Image 101*) are also dated to the Old Kingdom.

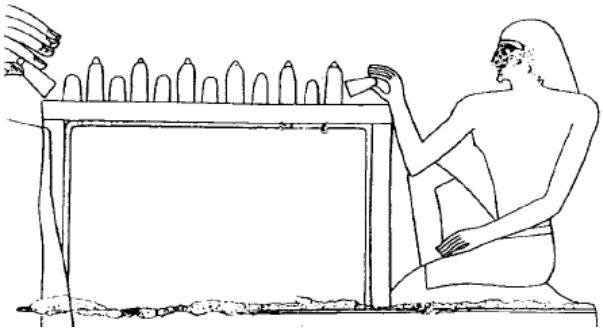

Image 100: Table scene from the tomb of Mereruka.

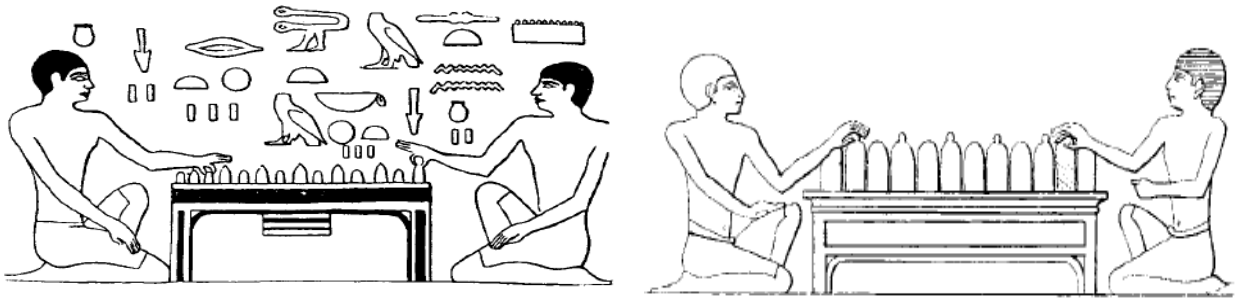

Image 101: Table scenes, Old Kingdom.

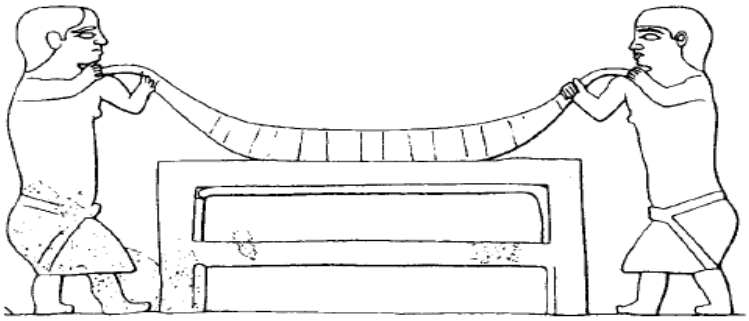

Image 102: Low tables for smaller people.

Interestingly enough, tables were also created lower to the ground to allow the 'little workforce' of Egypt to conduct their duties (*Image 102*). Smaller, single function tables were also created for specific functions, such as supporting cooking vessels and/or water jugs (Brovarski 1996: 146). In addition to these illustrations, a wall painting from a 12th Dynasty tomb at El-Bersha details a number of different tables and stands, all of varying heights and lengths (Baker 1966: 151).

6.3.17 Bed canopies (All periods)

Palaces and royal residencies would have been abuzz with servants, personal attendants and guards, making it difficult for the individual to enjoy the luxuries of life in private. Therefore, the ancient Egyptian carpenter devised a simple, yet highly effective, structure to

provide some privacy. In this instance the tomb of Queen Hetepheres once again provides us with the perfect example. The Queen's canopy (*Plate 103*) is a box-shaped frame made from wooden poles and beams, skilfully joined and covered in gold. Below the top beam of the frame we encounter a horizontal wooden pole used as a curtain rail. Netting and curtains would be hung from copper hoops on the rail, providing the Queen with privacy and protection from insects. The names and titles of the Queen and her husband Snefru have been raised in relief on the gold plating of the vertical corner beams. Although bed canopies are rarely encountered in the material record, we know from tomb scenes that they were quite common. An example of a similar canopy also dates to the 4th Dynasty, and originates from the Giza tomb of Queen Mersyankh III (Baker 1966: 43-45, Killen 1994a: 31).

6.3.18 Screens (All periods)

The use of bed canopies and curtains confirm that the ancient Egyptians valued their privacy as much as we do today. While canopies provided an easy form of privacy, with curtains that could be opened or closed, screens provided more permanent divisions, allowing the individual to deploy them as room dividers. These screens were also more solid, and quite heavy, being made of wooden planks and beams. Each screen stood on a unique footrest that provided structural stability, while gild work provided rich embellishment. The items could be moved and placed in the desired position, allowing rooms to be divided as seen fit. Our best example comes in the form of a relief carving from the temple of Thutmosis III at Karnak (*Image 103*). Although the illustrations may in some instances appear to depict cabinets, these images in fact represent screens, as the term *Sbht* clearly defines them as an individual class of furniture (Spencer 1980: 161-162).

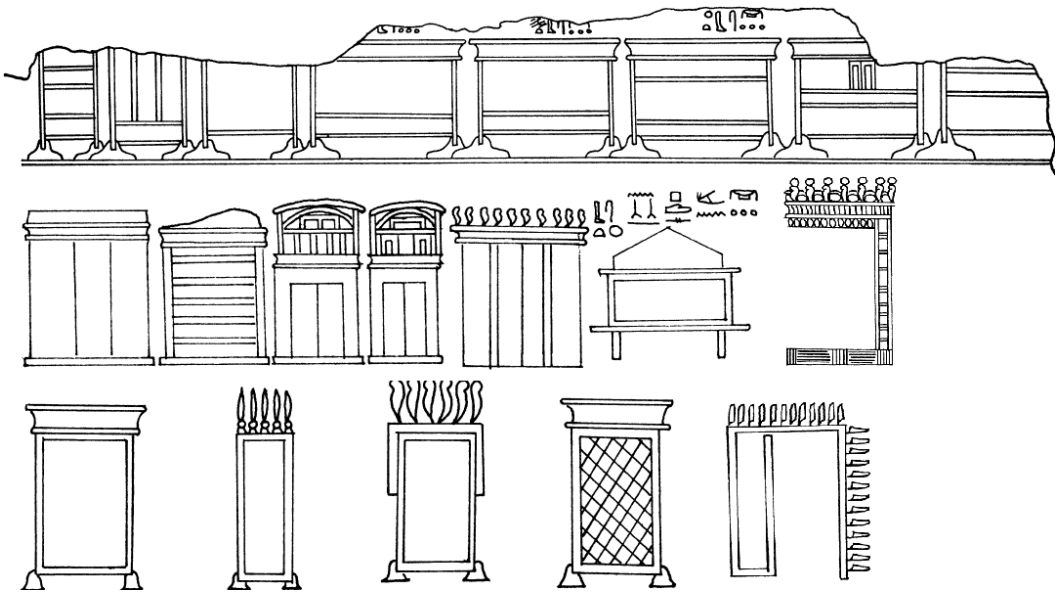

Image 103: Screens from the temple of Thutmosis III.

6.4 CONCLUSION

Throughout this chapter we have discovered that style remains the most insightful area of study when tracing the chronological evolution of furniture. The combination of physical dimensions, decoration and artistic expression provides us with characteristic markers to be used within stylistic analysis. With designs ranging from architectonic to thereomorphic and anthropomorphic, specific elements allow us to place certain items within technical and decorative categories.

Through a study of the various designs we have come to realise that many of these seemingly decorative features held deeper meaning to the ancient Egyptians. The adoption of animal forms, for example, can be seen as a development which reflected a combination of mythological beliefs and changing social, cultural and political circumstances. Lotus and papyrus flower designs symbolised the unification of Upper and Lower Egypt, bearing little meaning to the Egyptians in Predynastic times or during periods when unification was temporarily dissolved. Full-bodied lions, vultures and uraeus cobras adorned numerous items, serving structural, decorative and apotrapaic functions, while painted slaves on the

footstools of Pharaohs symbolised the domination of Egypt over foreign nations. Indeed, in combination with the divine protective powers inherent in wood (*refer to chapter 2*) it appears as though highly embellished items, such as the golden throne of Tutankhamun , would have provided a seemingly impenetrable fortress of divine protection, complimented by a bold display of imperial power.

From our discussions focusing on individual furniture items, their structural components, decorative motifs and over-all style, we have gained a better understanding of the home environment and domestic life of the ancient Egyptians. From the primitive straw and wooden plank beds, to the gold-plated and richly embellished royal funerary beds, we have traversed through a world of utilitarian, royal and ritual wares. From the simplest roughly carved stool, to the golden bed canopy of Queen Hetepheres, each and every item of Egyptian furniture was carved with skill, despite the quality of the materials used.

What we have learned is that the Egyptian carpentry industry was by no means rigid. In fact, it was a highly adaptive and creative industry, allowing for innovations in the realms of joinery, structural integrity, colour expression, and decorative excellence. The transmigration of structural and decorative characteristics between items led to a true evolution of the furniture industry, in that no style supplanted or completely replaced another. Rather, there was a high level of hybridity, between different items (stool, chairs, beds, boxes, etc), which in the end allowed Egyptian furniture to develop its unique local characteristics.

These characteristics were shared among Egyptian items, but contrasted with Egyptian-styled items from the surrounding Ancient Near East. Despite the existence of an ‘international style’ between 1400 to 1200 BC, as described by William Stevenson-Smith in the 1960s (Feldman 2002: 6), ancient Egyptian furniture maintained a unified corpus of physical styles and decorative techniques that allowed it to stand out among other Ancient Near Eastern or ‘international’ styles. In fact, judging by the vast number of Egyptian styled motifs around the Mediterranean and the rest of the Ancient Near East, one can see ancient

Egypt as the main proprietor in the spread of international style. This spread of culture was mainly enabled by the imperial expansion of Pharaonic territories under the reign of the 18th Dynasty Kings (1550-c.1292).

Period specific changes did occur, but the core character and unique identity of ancient Egyptian furniture remained fundamentally unchanged. These core characteristics had all developed prior to 1400 BC, and had already become solidified as a system of material culture by the time 'international' style was most influential. This unchanging traditionalist character of styles and designs was mainly the result of relatively stable patterns of economy, politics, religion and environmental viewpoints over the 4000 year long period under discussion. By tracing the development of styles and designs, we will enable ourselves to assign relative dates to furniture items based upon stylistic analyses and comparative studies.

With highly fragile items unable to withstand rigorous testing, our first consideration should be towards applying non-destructive means of dating and classification. Despite our efforts to analyse items according to stylistics, some objects will have to be tested, not to obtain relative dates, but rather to assess states of preservation and/or deterioration.

In our following chapter we will look into modern assessment techniques and methods that will help to preserve, restore and reconstruct these works of art: by combining these elements with our knowledge of ancient methods and techniques we can determine the most appropriate and holistic solutions to conservation issues.

CHAPTER 7

FURNITURE ASSESSMENT: DETERIORATION, PRESERVATION AND RESTORATION

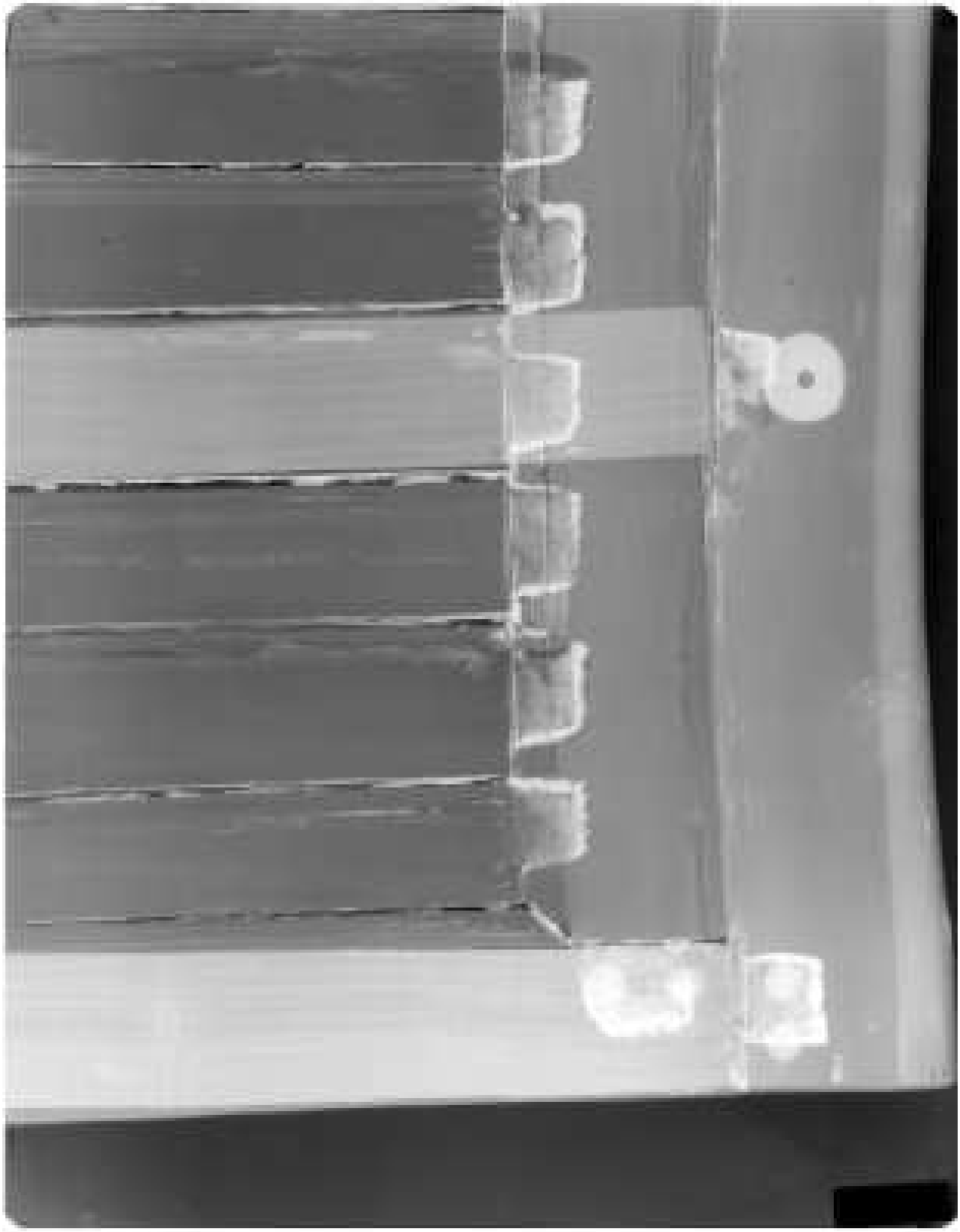

Image 104: X-ray image of an ancient Egyptian chair.

7.1 INTRODUCTION

One of the single most important steps in working towards restoration and future preservation is the assessment of the current level of deterioration either upon excavation, or in the case of tomb finds, the moment of discovery. Not only newly discovered items, but also those restored decades ago, have to be re-evaluated and checked for any degradation[227] that may have taken place. This is because the effectiveness and longevity of chemicals were yet unknown when first applied in the early to mid 20th century, and restoration methods were not yet at an optimal level. Furthermore, upon re-evaluation, restorers want to distinguish between the original ancient materials, and substitute materials used during modern-day restoration[228] (Deschler-Erb et al 2004: 647). In this regard, highly efficient technologies are available to assess the successes and failures of previous restoration efforts (Boone & Markov 1995: 103).

As an example, one of the biggest threats to ancient Egyptian furniture presents itself in the form of microbial or biological agents of decay, which are responsible for the physical deterioration and overall weakening of the structure of the wood. As both forms of decay affect the physical strength of the wood, it is important to conduct non-destructive tests that can determine the current state of the wood without posing a serious threat to the artefact's integrity. Furthermore, accurate evaluations of production materials can reveal chronological and geographical information, which can lead to a better understanding of the ancient Egyptian furniture industry. As Mantler and Schreiner (2000: 3) put it:

> *Investigations of the physical properties and chemical compositions of the artefacts are helpful and increasingly applied to allocate an object to a particular*

[227] Degradation may take the form of aged chemical treatments, discoloured paint, weakened adhesives or decomposing material (Gansicke et al 2003: 193).

[228] Case studies in this regard include the work done by Deschler-Erb and colleagues on items of metal and wood originating from the Roman period and the European Iron Age (Deschler-Erb et al 2004: 647-661), as well as the re-examination of a lyre from the city of Ur (Greene 2003: 267-278), which was restored during the 1970s . Both cases stand as testimony to the wide variety of methods at our disposal, which can also be applied in our study of ancient furniture. A thorough understanding of these methods will allow us to make educated decisions in order to ensure the conservation of this specific facet of material culture.

historic or prehistoric context, to determine the correctness of the claimed provenance or to explore the technology used for manufacturing.

Because visual grading alone no longer constitutes a thorough assessment[229], we can consider one or more of the following, more scientific options.

7.2 MODERN TECHNOLOGIES

7.2.1 Ultrasound

Ultrasound is incredibly effective because it allows the researcher to identify the internal features of specimens, delineating the size and locations of defects such as knots, splits, checks and shakes (Schmoldt et al 1994: 183). Its astuteness in penetrating the surface of the wood means ultrasound is also capable of assessing the extent of defects caused by microbial agents of decay. To add to its technical effectiveness, it is also practical and efficient, as portable diagnostic ultrasonic devices are available (Bláha et al 2008: 3). The major drawback though is that objects have to be immersed in a coupling medium, such as oil, grease or water, for the image to be taken (Green 2004: 9). It is thus a viable option only when we are in the position to take samples. Alternatively, when complete items of ancient Egyptian furniture have to be assessed, restorers can consider Air-coupled Ultrasound or ACU.

7.2.2 Air-coupled Ultrasound (ACU)

This technology allows investigators to detect wood flaws including voids, splits, checks and cleavage underlying decorative elements such as gesso, paint, metal leaf and wood veneer.

[229] In combination with assessments evaluating the physical condition of artefacts, ultrastructural and chemical investigations of production materials are valuable to our field of study, as they can provide scientific support for the stylistic (and chronological) analyses discussed in prior chapters.

The ACU method allows for the generation of two-dimensional images without the need for the mechanical scanner to come into direct contact with the surface of the object (Murray et al 1996: 145-146). Air-coupled Ultrasound is thus one of the most effective, non-destructive technologies at the disposal of restorers, as the technique utilises air as a coupling medium instead of oil, grease or water. The greater benefit of this technique above that of traditional ultrasonics is that the air-coupled system allows for greater penetration, resulting in higher resolutions and clearer images (Buckley 2000: 1).

7.2.3 Acoustic Emission Monitoring (AEM)

The AEM technique is used to monitor the fracture intensity of wood that has been, or still is exposed to fluctuating temperatures and relative humidity in order to trace the evolution of damage in ancient wood. The most important application of this technique is in aiding the wood drying process in order to avoid mechanical damage, such as warping and cracking, but it can also be used to identify fungal growths, insect activities, and general damage in wooden artefacts (Jakiela et al 2007: 270). The technique can thus be used to monitor the condition of ancient Egyptian furniture during transportation to, and from, storage facilities, research centres and/or museums.

7.2.4 Infrared Thermography (IT)

Infrared Thermography is a non-destructive technology that focuses upon the thermal properties (more specifically heat flow) of materials such as wood, in order to locate wood rupture phenomena, voids, knots, decay, structural defects, grain slope, moisture diffusion, and other anomalies (Rosina & Robinson 2002: 37-38). The raster scanning radiometer employed by this technique detects these anomalies as sub-surface temperature distributions appearing as either cold (dark) or hot (light) spots in an image referred to as

thermogram (Miller 1977: 29). Alternatively, a simple infrared camera can be used to produce images of artefacts that are still *in situ* (Bucur 2003: 93). It must however, be kept in mind that the effectiveness of this technique is greatly dependent on the material properties of the object, as well as the size and location of the anomaly (Murray et al 1996: 146).

To expand upon its versatility, Infrared Thermography allows us to investigate the condition of the wood beneath materials such as plaster and stucco, while at the same time identifying structural features such as joints (Rosina & Robinson 2002: 40). This is of great benefit to our study of ancient Egyptian furniture construction, as carved joints, pins and nails were often covered by various materials in an attempt to cover up shoddy workmanship or inferior timber quality (as discussed in chapter 4).

Furthermore, the loss of bondage between paint layers and the wood itself, commonly referred to as “cleavage”, can be detected by infrared thermography. The technique can even detect the presence of tunnelling insects responsible for the separation of the above-mentioned paint layers from their bases (Miller 1977: 27). This technology is of exceptional value to conservation officials as it allows them to assess both ancient and modern treatments. The best example in this instance would be the 18th Dynasty painted chair with blue legs, currently housed in the Louvre, Paris (*Plate 72*).

7.2.5 Video Holography (VH)

Video Holography (VH) and Holographic Interferometry (VI) are two non-destructive techniques whereby electronic or digital speckle pattern interferometry is used in conjunction with computer imaging software in order to locate stresses and defects in various artefacts. With the aid of a microscope, restorers can investigate the 3-D microstructure of furniture without the need to come into direct contact with the surface of the item (Boone & Markov 1995: 103).

7.2.6 Ionizing Radiation (x-ray and gamma) Screening (IRS)

X-ray Screening is another highly effective technique in determining the condition of wooden objects, with gamma sources (such as Co-60) being used to penetrate thicker samples, thus revealing hidden inner conditions. It is also efficient in screening through corrosive agglomerations (Deschler-Erb et al 2004: 649) and patina, a technique which can enable the researcher to assess the condition of the underlying metal parts, such as embossed plates and inlays. Because images are taken as “slices”, it is possible to compose 3-D images (Bucur 2003: 92) of wooden artefacts, providing us with detailed models of furniture that can be electronically inspected from multiple angles.

Besides the technical efficiency of this technology, x-ray screening is also a preferred technique of assessment in the field due to the portable nature of the DIMAP Mk2 system. The system can also be linked to a laptop in order to display high quality images (Bláha et al 2008: 4). Items of furniture can thus be scanned prior to their removal from tombs or other delicate archaeological contexts.

Not only can this technique be used to investigate the density of wood, but it can also be used to detect the presence of wood boring insects (Fisher & Tasker 1940: 92). In addition, x-ray screening can provide detailed measurements of the thickness of metals (Deschler-Erb et al 2004: 657). These measurements can provide insightful information to the establishment of a relative chronology for ancient Egyptian furniture, as metal thickness, or rather, thinness, would have changed over time.

7.2.7 Neutron Transmission Radiography (NTR)

Neutron Transmission Radiography bears many similarities to x-ray screening (and can also be used complementary to x-rays), but uses either thermal or cold neutrons to obtain a digital image. Both technologies can be used to provide us with three-dimensional images of

artefacts by taking multiple projections from various angles around the object (Deschler-Erb et al 2004: 649). The combination of these two technologies allows us to view sensitive metal objects that are covered by organic materials such as wood and leather, and which cannot be removed from these housings due to the risk of causing irreversible damage. The technique will also allow us to view the exact setting of furniture pins, nails, and other metal fixtures hidden from the naked eye. It thus provides the perfect non-destructive technique when studying ancient furniture. The major drawback to using neutron transmission radiography, and any nuclear magnetic imaging techniques, is that samples have to be taken to a nuclear facility for scanning, a process that can increase the cost of research.

7.2.8 X-ray Densitometry (XRD)

X-ray Densitometry is, as the name suggests, a technique which evaluates the density of wood specimens. Because density is directly related to the strength of cell walls, x-ray densitometry can evaluate the extent of biological decay caused by white rot fungi by analysing the attenuated state of cell wall components, while at the same time identifying the characteristic spots and stains caused by the fungi[230] (*Plate 104*) (Tomazello et al 2008: 139-140).

7.2.9 X-ray Photoelectron Spectroscopy (XRPS)

X-ray Photoelectrical Spectroscopy is used as a means of chemical analyses for surface elements (no thicker than 5 mm), such as paint pigments and bonding liquid (Beecher & Frihart 2005: 83). The major drawback is that specimens, 1 cm^2 and 1 mm thickness, have to be taken, saturated with acetic anhydride, and heated (Beecher & Frihart 2005: 85). For this obvious reason, its use cannot, for conservation purposes, be extended to well-

[230] The microscopic structure of *Eucalyptus grandis x urophylla* is clearly visible by means of X-ray Densitometry. Slide A1 and A2 show the healthy appearance of the wood, while B1 and B2 are clearly infected by white rot fungi.

preserved items of furniture, but it may prove of use in cases where only fragmentary pieces of furniture remain. Results obtained can then be used in comparative studies.

7.2.10 Xeroradiography

Xeroradiography, a type of x-ray that uses paper instead of film, has been effectively used on wood cores to conduct tree ring dating/dendrochronology (Heinemann 1976: 106). The technique has been used to study the condition of works of art, especially paintings (Murray et al 1996:146), and can therefore prove of worth to the study of ancient furniture by assessing the condition of painted artefacts.

As seen in the images below, Xeroradiography is ideal for the analysis of ancient artefacts (*Image 105 - 107*). Apart from the water damage on the top right x-ray of *Image 107,* the surrounding x-rays clearly identify phenomena in the wood itself, which show up as either dark or exceptionally light areas (depending on the density). We are also able to identify the deep mortise and tenon system employed to fasten the vertical backrest slats to the frame. Pins, nails and other metal supports become clearly visible and we are able analyse the internal structure of the item without taking it apart.

7.2.11 X-ray Fluorescence Spectrometry (XRFS)

X-ray Fluorescence (XRF) Spectrometry is widely used to identify the composition of various samples[231], and is especially useful when examining the work of earlier restorers[232]. The technique can be used to reveal underlying layers of paint, generally referred to as

[231] XRF, along with xeroradiography, scanning electron microscopy and energy dispersive spectrometry have been used to analyse ancient faience composition (Mao 2000: 185), allowing us to establish a relative chronology for ancient Egyptian furniture.

[232] In this instance we are reminded of the 18th Dynasty chair housed by the Louvre museum in Paris (Plate 72). When restoration was done in the late 19th century it was decided to paint the legs blue, according to ancient Egyptian fashion. In future it might become necessary for researchers to re-evaluate the condition of the item. Using a technique like XRFS will be much easier that trying to attain information on paint layers using out-dated methods.

pentimenti. The pentimenti becomes increasingly visible when the top layers of paint[233] (*Plate 105*) become transparent with age. XRF also allows us to see past patina caused by corrosive elements. Pigments found in organic paints, varnish, wood preservatives, binding media, coloured glass and metal alloys can be studied at high resolution using electron-excited XRF (Mantler & Schreiner 2000: 3-4).

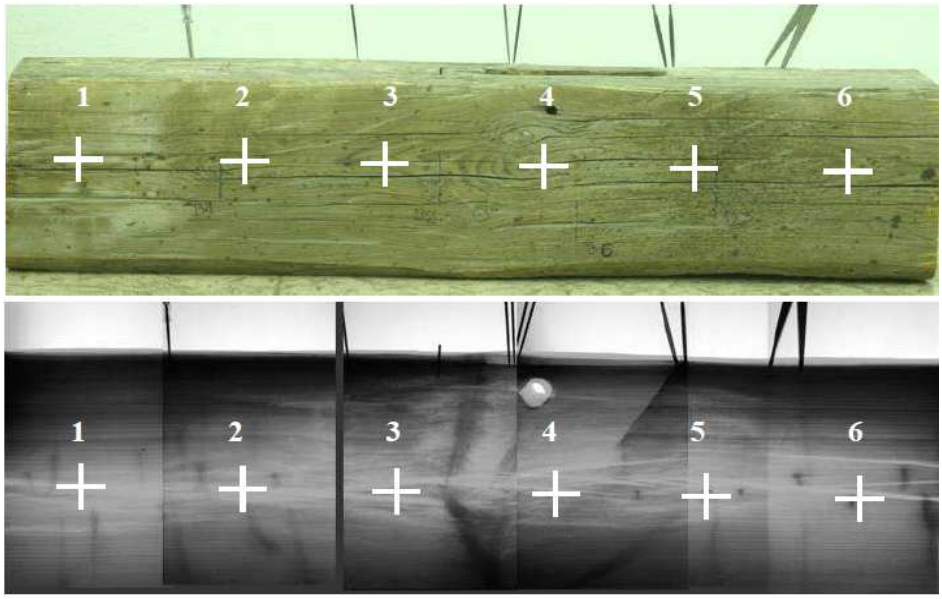

Image 105: X-ray scans of historic timber samples from Tocnik Castle near Prague. The thick white lines reveal open, dry areas, while the dark spots indicate knots. Darker areas are more dense than light areas.

Image 106: An X-ray of a 2000 year-old Roman helmet from the Giubiasco grave, Switzerland.

[233] *Plate 105:* The observable layers of paint on a 16th-century sculpture.

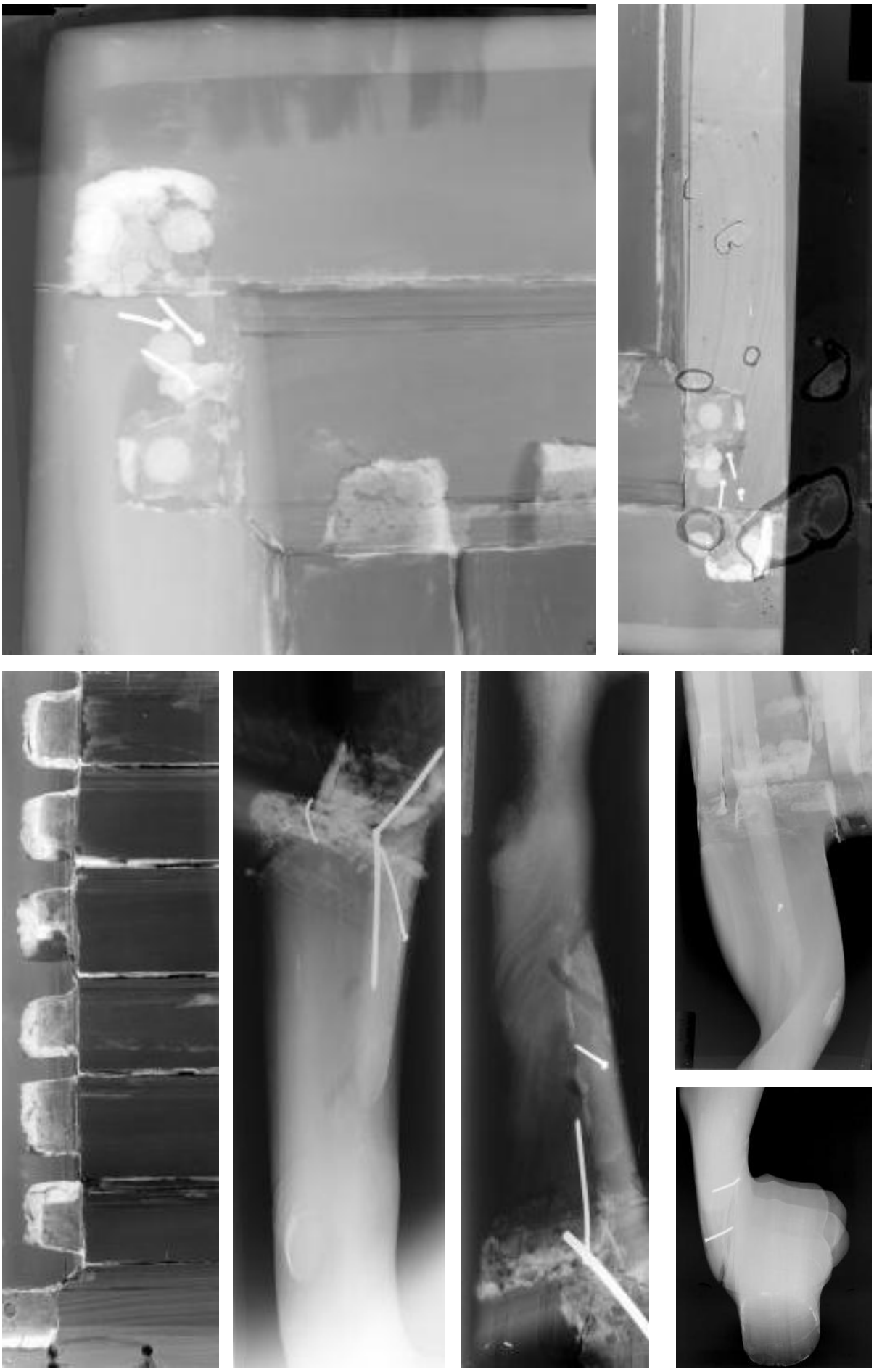

Image 107: X-ray images of an 18th Dynasty chair.

Various types of x-ray spectrometers have been developed that allow for the non-destructive analyses of larger objects without the necessity to directly touch or unnecessarily handle the artefact, and without causing extensive radiation damage (Mantler & Schreiner 2000: 7).

Furthermore, portable devices such as the EDXRD and EDXRF spectrometers (Potts et al 2005: 1135) enable researchers to study artefacts *in situ*[234], assessing the state of ancient furniture items before they are removed from their archaeological context, thus ensuring that the necessary steps are taken in order to assure the safety of the object. Compared to other technologies, x-ray spectrometry seems like the most viable option in the analyses of artefacts, but can deliver even greater results when used in conjunction with other techniques.

As an example of its use, x-ray fluorescence spectrometry has helped to identify the authenticity of turquoise beads from the Syrian Neolithic site of Tell el-Kerkh (Taniguchi et al 2002: 175). It is thus of great value to the researcher, as it can help to uncover imitation/substitute materials used as ancient Egyptian decorative elements. As Mulford (1982: 26) mentions, other modern techniques that have been used to identify faience chemical compositions include optical emission spectrometry, x-ray emission, lead isotope analysis as well as thin section photomicrography.

Lead isotope analysis can be of exceptional value to researchers analysing lead-alkaline glazed faience from the Ptolemaic Period[235]. Chemical compositions (as discussed in *Table 24*) unique to faience from different periods will aid us in establishing a more direct chronology for ancient Egyptian furniture containing artificial (glass and faience) inlays.

[234] Portable equipment will allow archaeologists to assess ancient Egyptian furniture before it is removed from temple, tomb or other excavated environment. This analysis will allow archaeologists to organize delicate evacuation procedures for removing and transporting the items.
[235] For a discussion on Ptolemaic faience refer to the article by Mao (2000).

7.2.12 Lightfastness Measurements

Given that the fading of coloured objects is of great concern to conservators, it is suggested that all painted and gessoed items of furniture be assessed by a microfading tester in order to measure the lightfastness of materials (Whitmore et al 1999: 395). By identifying the light sensitivity of a specific artefact, precautions can be implemented that limit the amount of light, both natural and artificial, to which the item is exposed on a regular basis. In the case of previously restored items, the different pigments used can be analysed, and their lightfastness tested, in order for us to make more educated and informed decisions when next selecting pigments for restoration work[236].

7.2.13 Microscopic analysis

Although non-destructive scanning techniques are preferred methods of analysis, sample orientated analysis can be performed on items that are not particularly fragile or sensitive. For example, in the case of remnant timber beams excavated from the archaeological records, we can easily acquire a few samples for microscopic analysis, seeing as these items are not necessarily of high cultural value.

In the case of ancient Egyptian tombs, botanical specimens are often well preserved, thanks to the dry conditions of sealed tombs. These samples can then be viewed under microscopes to identify unique characteristics of the cellular structure. Because of this unique structure we can distinguish between specific species. Work done by L.A Boole and Dr C.R Metcalfe at the Jodrell Laboratory at Kew on ancient Egyptian specimens has left us with a large amount of slides for comparative studies (Hepper 2009: 6).

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[236] Additional technologies also include microwaves, optical emission spectrometry (OES), atomic absorption spectrometry (AAS), x-ray defractrometry (XRD), photogrammetry, as well as ultraviolet, infrared, thermo- and micro-luorimetry. The above-mentioned methods of imaging are all of great importance to the field of restoration, because what might seem like a fairly well preserved item of furniture upon preliminary visual inspection, may in fact be crumbling from the inside.

7.3 AGENTS OF DECAY

Hidden in the ground for almost 2000 years or longer, objects of archaeological importance and relevance have been damaged by their environment. When excavated, the corrosive and damaging process continues, and all investigations of the objects have to be performed very carefully to avoid damaging the objects further.

Deschler-Erb et al 2004: 647

Knowledge of these different degradation processes and the resulting conditions of the wood provide important information that can now be used for developing appropriate conservation and restoration procedures.

Rowell et al 2007: 65

Different forms of deterioration can occur, depending on the nature of the setting in which the item has survived over the past millennia (i.e. tomb, archaeological deposit, submerged/waterlogged). For the purpose of this research we will look at the prevailing forms of deterioration encountered in tombs and/or sealed features of monuments. These include various forms of biological decay, non-biological decay, as well as chemical forms of decay (Blanchette et al 1994: 55).

As mentioned above, different non-destructive imaging techniques can also be used to create images of decay, as rotten areas are usually characterised by missing tree-rings, thick white lines denoting cracks and knots (Bláha et al 2008: 4) or characteristic spots and stains (Tomazello et al 2008: 140). Once the areas of decay have been pin-pointed, one has to identify the various agents of decay, based upon distinct morphological characteristics. One technique for achieving this is by examining the wood at a cellular or microstructural level through scanning electron microscopy (*Image 108 & 109*), which will visibly identify chemical and biological elements of decay (Spirydowicz et al 2001: 46). Alternatively, a chemical technique known as stable nitrogen isotope testing can also be

done in order to determine the exact nature of the nutrients upon which microbial agents of decay proliferate (Filley et al 2001: 13346). Once these have been identified one can go about eliminating, or at least minimizing, these agents, in effect halting or abating the rate of decay.

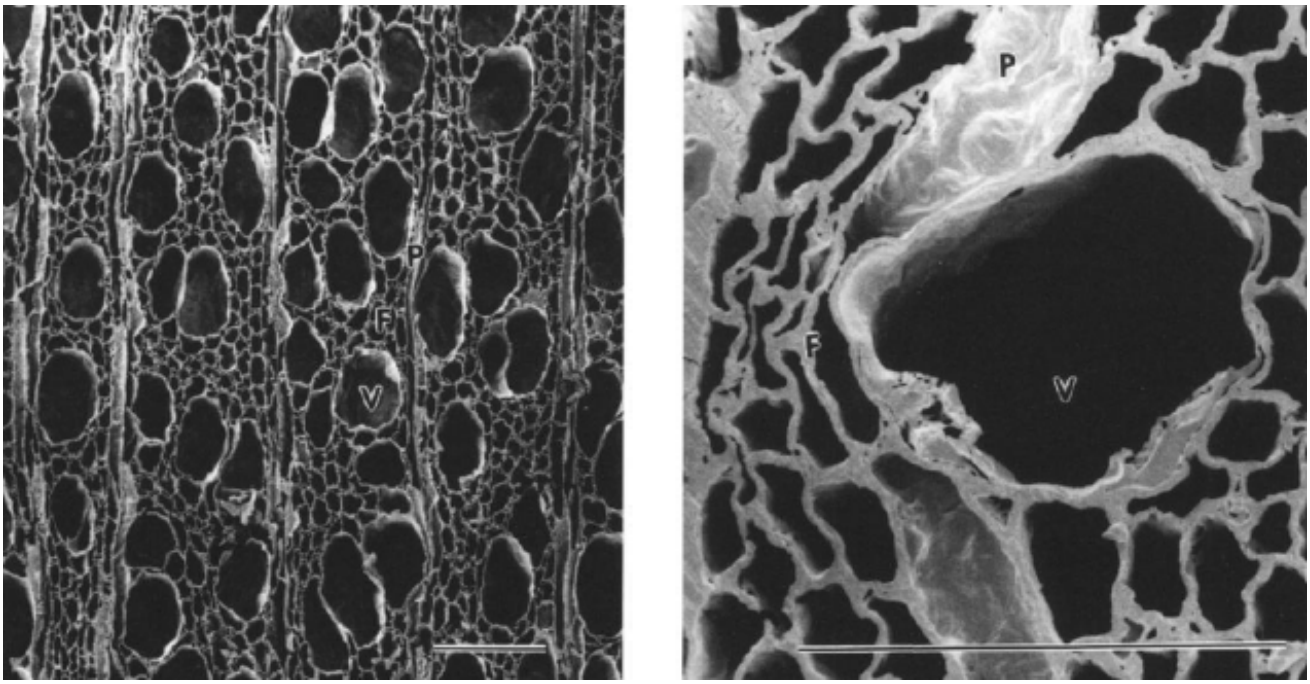

Image 108: Scanning electron micrographs indicating the deteriorated microstructure of boxwood furniture fragments from Tumulus P, Gordion, Anatolia (Turkey).

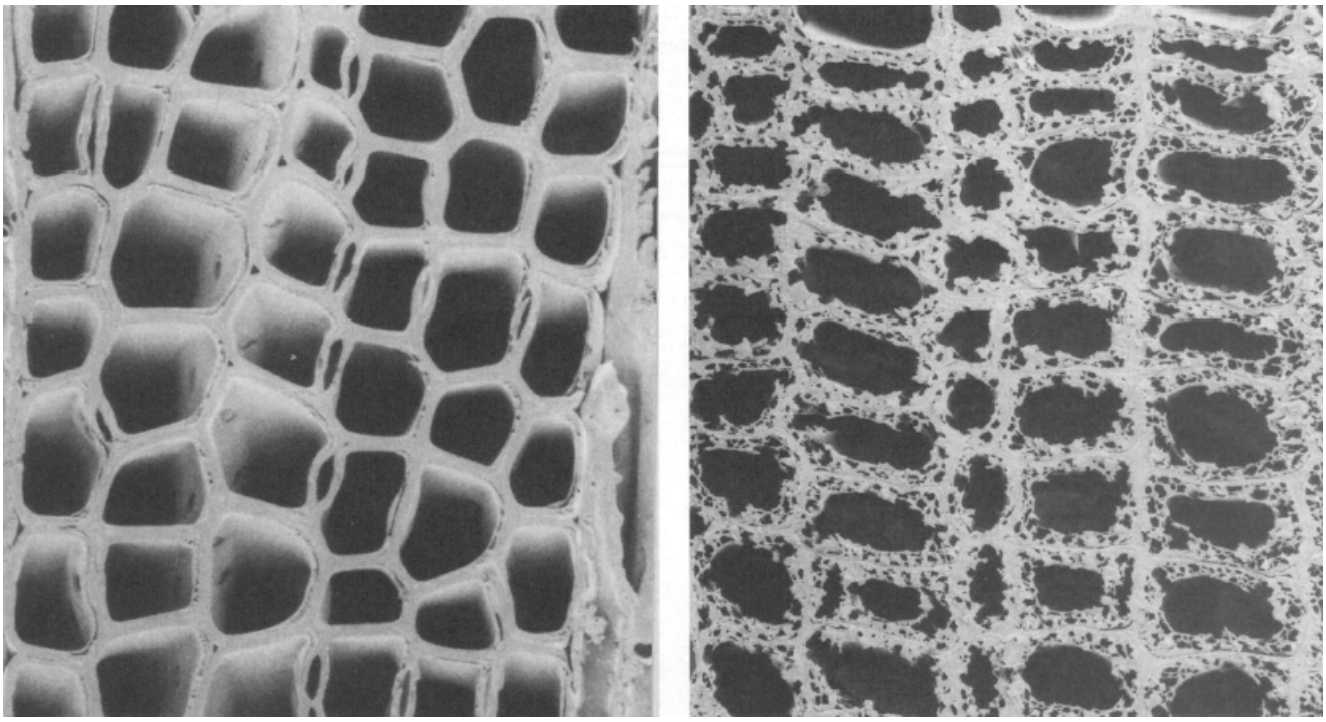

Image 109: Scanning electron micrograph of healthy cedar (left) and decayed cedar (right) from the King Midas tomb, Gordion, Anatolia (Turkey).

One must also take into consideration that the level of decay is directly influenced by the physicochemical (relating to both physical and chemical properties) environment encountered within the ancient Egyptian tomb (as was the case with Tumulus P and the King Midas tomb, Gordion). For example, a high humidity within a tomb or chamber might provide the perfect conditions for the multiplication of biological agents of decay such as brown, white, and soft rot fungi. Within this context, the proliferation of wood decaying microbes is accelerated by the presence of nutrients, which can be derived from human remains and foodstuffs. Ironically, the very items that were left to ensure life after death, namely offerings of food and drink, would inadvertently cause the decay of organic materials. Degrading bodies, or mummies that have not been properly preserved, also provide protein rich environments for biological agents of decay, as residual nitrogen is stored within the decaying wood[237] (Filley et al 2001: 13346).

In contrast to microbial/biological decay, non-biological decay might be caused by the powdering of rock surfaces within tombs, possibly giving rise to a level of mechanical decay, a process in which dust particles weather away the wood through a grinding or sanding action. An example of such a decaying tomb comes from the Elephant Tomb in the Necropolis of Carmona, Seville, Spain (Arino & Saiz-Jimenez 1997: 233-239). In contrast, Limestone in particular would in turn give rise to chemical decay, as it has an alkaline nature. To elaborate on this, chemical decay occurs when certain elements react with the wood itself, resulting in changes within the wood cells. This form of decay occurs when the wooden surfaces are in direct contact with other surfaces or applied substances such as gypsum. Even metal coverings, fittings and nails on items of furniture may cause decay, as the corrosion of metal accelerates the rate of decay in wood, especially in conditions with high moisture levels (Blanchette et al 1994: 56). If the moisture level within the wood itself is

[237] White rot fungi is the most notorious enemy of ancient Egyptian furniture, because of its ability to reduce the density of wood by decomposing cell components such as lignin, cellulose and hemicelluloses, while also destroying pit membranes, which all, in effect, severely alter the mechanical properties of the wood (Tomazello et al 2008: 141).

thus not reduced to its required minimum prior to manufacture, the moisture levels within the wood would give rise to metal corrosion, however minimal (*Refer to the later section on wood moisture levels*, chapter 7).

As mentioned above, the preservation of wooden objects can also be influenced by the deterioration of paints and gesso (originally used to cover up wood flaws and shoddy workmanship in ancient times). Because ancient paints were organic, they are subject to organic decay, and contact between wooden surfaces and decaying paint may trigger the process of decay in the wood itself. Gesso (a combination of powdered calcium carbonate and animal glue) and gypsum (calcium sulphate dehydrate) can also give rise to decay in wood if the object is exposed to the substance over an extended period of time. This is because the levels of sodium, other salts, and calcium increase during contact, causing alkaline conditions detrimental to the preservation of wood. The presence of moisture in tombs accelerates the process (Blanchette et al 1994: 60-62). Fortunately, one of the greatest blessings bestowed upon ancient Egyptian furniture is that Egypt possesses a dry, arid climate, directly promoting the preservation of organic matter such as wood. Despite this, not all items of Egyptian furniture have remained well preserved, as the majority of items visibly suffer from varying levels of decay. Brown and soft rot fungi both require sufficient moisture levels to prosper (Blanchette et al 1994: 65), indicating that Egyptian tombs were not entirely devoid of moisture. Yet items from Egypt still provide us with more examples of ancient furniture than most other Ancient Near Eastern civilizations, especially when compared to those located in wetter, more humid regions (such as the fertile crescent, the Mediterranean coast, and the banks of major rivers, such as the Tigris and Euphrates).

7.4 TREATMENTS

7.4.1 Ancient methods of protecting against deterioration

On the other side of the spectrum, where items have been successfully preserved over the millennia through the application of preservation chemicals in ancient times, such as resin[238], one should try to establish the exact nature of these ancient chemicals, as to prevent the introduction of conflicting, and therefore detrimental, elements during reconstruction and conservation. The effects of certain modern-day treatments may prove to be a greater threat in the long run if we do not consider the knowledge of the ancients.

The physicochemical environment of a tomb cannot always be controlled, as sealed tombs provide slightly different preservation conditions compared to tombs which have been opened, thus exposing their contents to outside elements. However, what could be controlled was the manner in which items of wooden furniture were treated in ancient times in order to withstand the various agents of decay. In basic terms, the chemical modification of wood can give items a level of resistance from the attacks of biological agents such as brown rot fungi (Rowell et al 2007: 65). Over the past few decades, research has revealed that certain treatments were applied during ancient times to ensure the preservation of wooden items, many of which relate directly to the preservation chemicals used during mummification. Not only the chemical treatments applied to the wood, but also the type of wood itself would have influenced the level of degradation over the millennia. Recent research has proposed that certain types of wood were intentionally selected during ancient times for their known resistance to decay, with an excellent example originating from the King Midas Tomb, Gordion, Turkey (Filley et al 2001: 13346).

[238] One of the best examples of the application of resin originates from the ebony throne of Tutankhamun. Eaton-Krauss (2008) mentions that resin applied over red painted gesso may give the appearance of cracked leather.

7.4.2 Modern-day methods of protecting against deterioration

During the 1960s and 70s a number of preservation chemicals were applied to ancient wooden artefacts in the hope that these would halt, or at least decrease, the mechanisms of decay. Fish glue, cellulose nitrite, Dekadhese and Elmer's Glue-All were some of the more popular adhesives[239] during the post-1970s era (Gansicke et al 2003: 203). The most popular chemicals at the time included epoxies and polyesters (thermosetting synthetic resins), as well as paraffin wax, PVAC resins and Polaroid B-72, which in the long run proved to have more disadvantages than benefits. Some of the major side effects include discolouration, undesired texture and uneven distributions of chemicals on the surface due to evaporation (Schniewind & Eastman 1994: 247). Thick resins with a high viscosity were used to cover up decorations or fill in finer carvings, as was the case with a lyre from Ur that was excavated and restored in the 1920s (Greene 2003: 261).

These chemicals have fortunately been replaced in later years by soluble thermoplastic resins[240] including Acryloid B-72 (an acrylic resin), Butvar B-98 (a polyvinyl butyral resin) and Alvar (a polyvinyl acetal resin), which have displayed significant improvements over their predecessors (Sakuno & Schniewind 1990: 34, Spirydowicz et al 2001: 45).

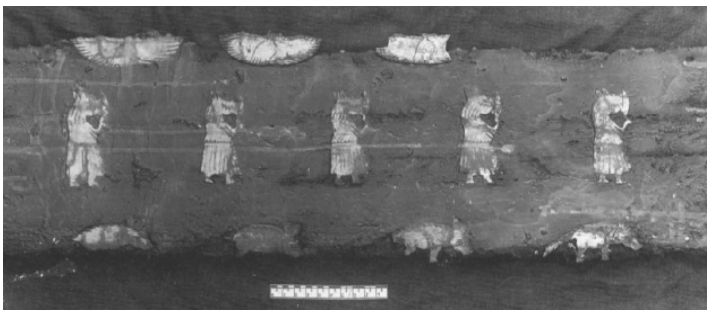

Image 110: Ivory inlays set on a badly decomposed wooden footboard. The inlays were consolidated in wax prior to their transportation from Kerma, Sudan[241].

[239] The ultraviolet examination of furniture can tell us whether or not the adhesives used on items are of modern or ancient origin. This investigation is based largely upon the analysis of proteins (and other natural compounds) that would have been present in ancient adhesives (Gansicke et al 2003: 203).

[240] These resins can be used as consolidants to strengthen deteriorated wood cells (Schniewind & Eastman 1994: 249), such as those seen in *Image 108.* An example of this practice comes from the Egyptian museum in Cairo's conservation of a coffin box (*Plate 106*) from the Greaco-Roman period (Zidan et al 2006: 31). Notice the decayed appearance of the wood prior to treatment (far left), the improving appearance during treatment (center images) and newly restored appearance after the treatment was completed (far right).

[241] Also refer to *Plates 42* and *54*.

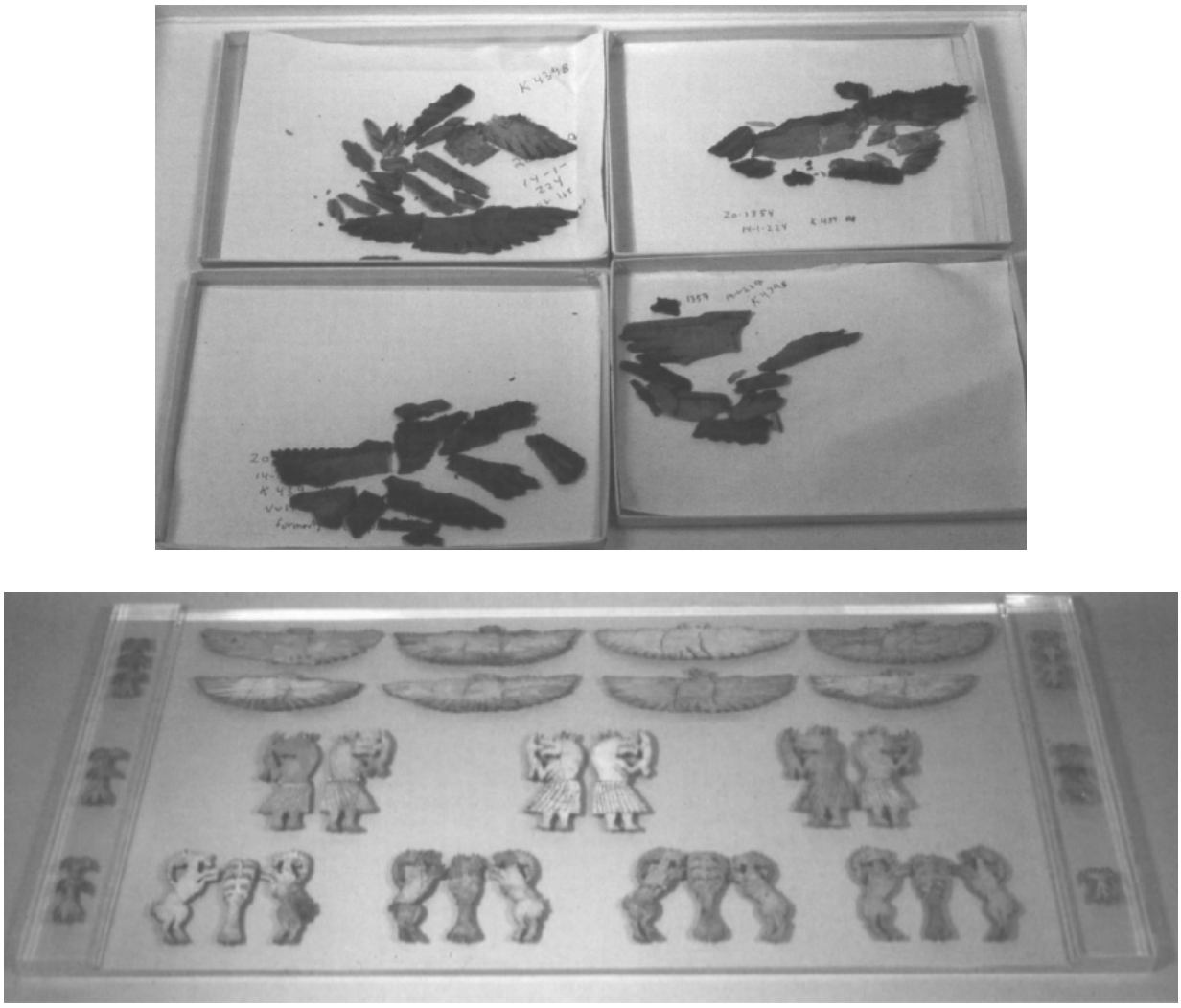

Image 111: Ivory inlays before and after treatment.

A key factor influencing the rate of success is the level to which the preservation substance permeates the object being treated. In some cases resins congregate on the surface, leaving the core untreated (Schniewind & Eastman 1994: 247). One of the greatest influencing factors in this regard is the manner in which the wood was cut (with or against the grain) in ancient times, which may directly influence the absorption rate of liquid chemicals. This is because wood is more permeable along, than across the grain (Schniewind & Eastman 1994: 248). Furthermore, the porosity of the wood, determined by the species selected in ancient times, will also influence the absorption of the resin. In short, if the core remains untreated, fungal infections can spread from within, or even disintegrate the core of the specimen to such an extent that the specimen collapses/implodes as a

whole.

To address this problem, resins with a low viscosity can be utilized, to allow for a higher rate of penetration and overall saturation. Resins with a low viscosity are also suitable as consolidants, as complete penetration is indeed possible (Sakuno & Schniewind 1990: 34). An added advantage here is that resins like Alvar remain colourless (even after 30 years of application) and remain easy to remove when using acetone, alcohols and glycol ethers, due to its solubility. Butvar-98 also maintains a low viscosity and causes very little discolouration, a desired result when treating furniture items boasting inlays of contrasting wood types/colours (Spirydowicz 2001: 47).

Butvar B-98 is one of the substances utilised for adding strength and consolidation to wood. This is particularly advantageous, as consolidants should also possess adhesive properties, as such properties aid in reattaching loose fragments (Sakuno & Schniewind 1990: 33). Alvar has also proved useful in this regard, as bronze studs decorating an item of furniture (from Gordion, Turkey) still remained intact after many years of storage (Spirydowicz 2001: 46). Along with this, Butvar B-98 has been tested to withstand extreme environmental conditions relating to heat, light exposure and humidity, while undergoing only minimal changes (Spirydowicz et al 2001: 54).

With regards to metal sheeting and inlays, certain chemicals can be applied, especially in circumstances where the metal is fragmenting or pulling away from the attached surface. Is such cases it is important to consolidate the metal with an acrylic emulsion such as Rhoplex AC-33 or Paraloid B-27 (an ethyl methacrylate copolymer) (Greene 2003: 269). In all cases, it is of the utmost importance to determine whether or not the item intended for restoration has been chemically treated in the past. The main reason for this is because the presence of older chemicals may interfere with the chemical composition of newly applied substances, which can cause undesired results, or in the worst case scenario: irreversible damage. As an example, certain consolidants may fail to set properly, and resins may fail to penetrate beneath the surface of the artefact, especially

if a previously applied resin or consolidant prohibits further absorption or hardening. Furthermore, we must also consider the fact that chemicals applied in the past may also influence present-day moisture readings, as certain chemicals carry a higher conductance, which will affect the accuracy of electric moisture meters. These chemicals include oil-borne organic preservatives (creosote & pentachlorophenol), glues, resins, and chemicals containing salt (James 1988: 15-16).

In the past (especially during the first half of the 20th century) modern-day paints were applied to objects in order to restore the appearance of chipped or faded ancient paints. While these applications seemed to fulfil their restoration goals at first glance, the long-term effects of modern-day paints were as yet unknown. Most detrimental to our cause, removing these paints can prove difficult, as many are resistant to solvents. As an alternative, removing the layer of paint by sanding the surface (as one would perhaps do with an antique piece of furniture you inherited from your grandmother) might seem an option, but sanding might cause further damage if the condition of the wood underlying the paint is unknown. Therefore it is best to treat chemical with chemical and remove the paint with a substance called dimethylformamide or methylene chloride, substances which have both proved their worth during the restoration of a lyre from the city of Ur (Greene 2003: 268). As an aid to our efforts, restorers can use digital paint thickness gauges in order to determine the precise thickness of the paint. In this manner we can determine exactly what we are up against.

7.5 ADDRESSING MOISTURE LEVELS

In spite of our best efforts in applying the most suited preservation chemicals, certain environmental factors will hamper the long-term effectiveness of any applied chemical. As Grattan (1989: 77) puts it:

> *When a wooden object enters a museum, moisture content becomes an immediate concern.*

Most conservationists would agree that a high moisture content is the main worry under museum conditions, because of its propensity to increase the likelihood of microbial decay, fungal staining, or physical distortions caused by swelling or shrinkage, Yet, excessively dry conditions may cause the wood to become desiccated and brittle, which will in turn cause even greater worries when soluble treatments are applied (as the re-absorption of moisture could cause the wood to swell or warp). Care should thus be taken not to 'bombard' desiccated wood with liquid chemicals such as soluble resins (Grattan 1989: 71-72).

Given the possible risks, it is of great importance to gain a preliminary assessment of moisture levels before any attempt at restoration is made. It is suggested that infrared thermography (Rosina & Robinson 2002: 40) be used first to detect the current state of moisture diffusion in the item of furniture, seeing as the technology is a non-destructive method of obtaining moisture related data. Whereas conventional moisture meters (discussed below) have to be placed in more than one location in order to gain an overview of the object in its entirety, infrared thermography can provide us with more holistic digital images of moisture diffusion.

7.5.1 Moisture meters

> *Moisture content affects most of the important properties of wood, and it can vary widely depending on the environment and history of the wood. Effective use of wood and wood-base materials, therefore, requires efficient and reliable methods of measuring wood moisture.*
>
> (James 1988: 1)

In order to address the pressing issue of moisture content: one should be able to keep a constant eye on these fluctuating levels. Until the recent past (late eighties and early

nineties), the most frequently used implements took the form of resistance moisture meters (such as conductance t-type meters (James 1988: 2), which usually had to be hammered into the surface of the wood in order to provide conservators with accurate readings. These implanted electrodes provided fairly accurate data, yet the pins themselves posed additional risks to artefacts, not only because they have to be hammered into the object, but because the metal pins presented other threats, most markedly in the form of corrosive chemical reactions and a propensity for fungal growths conjugating around the pins. In order to combat both threats, electrodes had to be of stainless steel, or at least nickel-plated, while also being permanently embedded within the artefact (Grattan 1989: 75-77). Furthermore, experiments have shown that permanently embedded electrodes can, after a few hours and under higher moisture levels, often supply erratic data, making these implants slightly unreliable under such conditions (James 1988: 8). Besides these drawbacks, and needless to say, any form of permanent attachment to an artefact is undesired and unsightly, and of course totally impractical when dealing with small, delicate items.

Fortunately, recent advances in technology have provided us with far more practical and efficient ways of dealing with the moisture issue. First of all, the hazardous element of penetrating electrodes was effectively combated by introducing non-penetrating surface electrodes, such as those employed by modern dielectric-type and conductance-type automatic moisture meters that use electrode pins (James 1988: 2), capacitive admittance-type moisture meters (James 1988: 9), as well as capacitance-type moisture meters that use sensor plates (Wilson 1999: 29).

Yet these meters also have their draw-backs. One of these is temperature related, as the temperature of the wood directly influences the electric conductance of the wood (James 1988: 2-3), which may lead to distorted readings. It is thus of the utmost importance to keep environmental conditions at a constant, if one desires to gain accurate data from these types of moisture meters. This can naturally be achieved by placing artefacts with environmentally regulated display cases. To add to this, the major draw-back lies within the

fact that surface electrodes are not as effective as penetrating/pin-type electrodes in measuring moisture levels towards the core of the artefact. Yet, to compensate for this disadvantage, surface meters can be fitted with thick-specimen electrodes, which can take accurate readings up to 50 mm below the surface (James 1988: 10). This is advantageous, as few furniture parts (i.e. legs, backrests, armrests, etc) measure over 100 mm in diameter.

In short, in order to make an educated decision about the choice of moisture meter, one must weigh up the advantages against the disadvantages in order to determine the feasibility of any implement, as the safety and preservation of the artefact should be our first concern.

7.6 CONCLUSION

Modern museum conservationists and restoration officers are highly skilled individuals who are, in essence, artists. The amount of skill required to restore or recreate these items could easily rival that of the ancient carpenter. Although this can be said of present-day conservationists, their predecessors were restricted in their work, largely due the limitations imposed by early 20th-century preservation technologies.

Where specific modern-day treatments seemed ideal in theory, the application turned out to have more detrimental affects than positive outcomes. In many instances, chemicals were applied before proper testing could be done to determine the longevity of treatments or the long-term effects on the item. Substances were also applied without properly testing the (often volatile) reactions that might occur between the ancient and modern chemical compounds.

Metal pins and other structural supports were often used in early preservation attempts, without proper consideration towards the authenticity of the techniques and materials employed. Paints and other liquid treatments, such as varnish and clear lacquer, were often applied without considering the difficulty future conservationists might experience

when attempting to remove these treatments. The result was that many attempts at conservation did more harm than good, at least from an aesthetic point of view.

Fortunately, present-day conservationists have access to a variety of non-destructive scanning techniques, such as those discussed above, as part of their vast array of assessment methods. Along with first-hand visual analysis, researchers can now use a multiplicity of imaging technologies ranging from Acoustic Emission Monitoring to Xeroradiography. These methods and techniques not only allow researchers to assess excavated artefacts before they are treated, but also allow them to investigate past conservation attempts. With the microscopic analysis of fungi types or applied chemicals, conservationists can now pinpoint problem areas and design tailor-made solutions.

Non-destructive scanning techniques also allow us to view internal characteristics or anomalies of items that have remained well-preserved. Hidden construction methods, including the use of nails and metal fixtures now become visible, while the thickness of paint and/or gesso layers can be measured without the employment of destructive sampling procedures.

All in all, non-destructive scanning techniques can aid furniture experts in verifying theories regarding ancient construction without taking potentially damaging samples. The individual species of wood can also be identified using various scanning techniques, providing concrete evidence for the presence of imported species and the trade links that brought commodities to Egypt.

CHAPTER 8

CONCLUSION

Throughout the course of this dissertation we have gained numerous insights into the world of the ancient carpenter by following a step-by-step overview of the ancient Egyptian furniture industry. From ancient production and preservation to modern-day reconstruction and conservation, we have walked in the footsteps of both the ancient carpenter and the modern researcher.

From the mythology of wood, to the physical characteristics of timber, we have discovered both the mythological and technical reasoning behind the selection of certain wood species. Through an understanding of the ancient mythological context of wood we have uncovered the Egyptian carpenter's unique divine relationship with his most basic medium of construction. Through sampling procedures and the analysis of key timber properties, we have discovered the more tangible, physical reasoning behind the selection of certain species and why the ancients held these species in high accord. In addition, we revealed how some items survived the passage of time due to their ideal densities or reduced moisture content. From hardwoods to softwoods, from fibrous to dense, we have learned that the import of new timber types innovatively led to the development of new carpentry tools, techniques and methods.

We have placed ourselves momentarily in the shoes of the ancient carpenter, exploring the wide variety of timber at his disposal. From the simple acacia, to the grand and mystical cedar, we have familiarised ourselves with the most common tree species available in ancient times, placing ourselves in the knowledgeable position to readily identify furniture superstructures.

Over-all, our understanding of wood characteristics and qualities will foster a greater appreciation of a raw material which is most often neglected in view of more elaborate decorative elements, such as gold and precious stones. In our modern-day context an

understanding of the physical properties of wood will also allow us to make more educated decisions when selecting raw materials to use during reconstruction, or even when creating true-to-form museum replicas.

During our investigation of international trade relations we investigated the import and export of local and foreign commodities through a complex web of land and sea networks. Through our research into archaeological evidence, selected textual references and works of art, it became apparent that international trade relations greatly affected the availability of raw materials, and that the rule of supply and demand was as valid in ancient times as it is today. Key production areas, trade cities and major trade routes were identified, effectively linking Egypt with her foreign nations.

We were able to address questions relating to the origins of certain species and how their positive identification within the archaeological record can help to verify the existence of trade relations between geographical regions, trade centres and political entities across a vast chronological timeframe. Lucrative periods of trade were identified, linking increased furniture production and more lavish designs directly with the availability of raw materials during politically stable eras. In addition, we learned that certain industries, such as glass and faience, experienced an economic boom in times when the demands for imported precious stones could not be met.

Images of expeditions to foreign lands supported theories of sustainable agriculture through the depiction of live tree import. Traditional views of ancient resource exploitation were challenged, providing evidence that the ancients were already thinking clearly about climate and vegetation change millennia before our modern ‘green revolution’ commenced.

Throughout this investigation it became apparent that complex relationships existed between raw material availability, tool quality, production methods, inlay types, etc, and that these elements in turn influenced styles and designs. Therefore it was also noted that these elements could be used as markers in the establishment of a relative chronology for ancient Egyptian furniture.

During our study of wood preparation and tools, we traced some of the crucial steps taken during the manufacturing process, discovering how apparently simple factors, such as careful felling, wood moisture content and correct seasoning could influence the longevity of furniture items over the centuries.

We found that certain technical elements, such as tool quality and shape, directly influenced the manufacturing process. The evolution of better, stronger tools allowed the carpenter to create more intricate joints. The desire to perfect joinery in turn inspired tool designers to develop custom instruments. These professional tools would later become highly specialised, replacing general or common tools with trade-specific types. The evolutionary development of the carpenter's tool kit thus highlighted the fact that certain tools produced certain end results and that particular styles and designs can be dated chronologically based on an evaluation of the technology used to create the item. In addition, the unique markings made by tools on wooden surfaces joined our list of possible investigative methods, when it came to identifying the kinds of tools used during the manufacturing process.

A review of the different construction methods, such as precision joinery and the use of metal pins, nails, brackets and hinges, revealed that the ancient carpenter possessed most of the manufacturing skills and technologies used in modern workshops. The use of lashings as mattress springs and joint supports proved that the ancient carpenter used his initiative to solve problems relating to both comfort and stability. The development of more advanced adhesive technologies originated from the need to affix decorative elements to the underlying wooden frame, a method that would later prove of great value to industries alongside that of furniture.

In our discussion on decorative elements, the beautiful art of inlay design and the craftsmanship of delicate foilwork was highlighted. We learned that a fine visual or aesthetic line existed between true semi-precious stones and their faience and glass imitations, and that even Pharaoh himself once sat on a throne inlaid with a combination of originals and

replicas. Marquetry and veneer work, along with the application of paint and gesso on certain items, supported the theory that ancient carpenters often covered inferior workmanship and/or poor quality wood with more appealing outer layers.

With regards to the application of resins, stains and varnish, it was revealed that ancient chemicals, originally created by the mummification sector, eventually permeated the furniture industry, resulting in the application of preservation chemicals that would extend the lifetime of ordinary items by thousands of years. Through our understanding of these treatments it was possible to establish a connection between ancient preservation chemicals and their modern-day counterparts in the final chapter.

In the core chapter of this dissertation on styles and designs, we discussed some of the prime examples from the ancient Egyptian furniture industry, and discovered some of the key characteristics displayed by different items across the three major time periods (Old, Middle and New Kingdom).

Overall, we discovered that furniture still conformed to certain proportional guidelines, as was the case with traditional art forms, but that the craft allowed for greater creative expression. Some of the most adhered-to proportional guidelines regulated elements such as dimension, shape and size, thus guiding support cone shape and height in relation to leg size, backrest height and seat width.

Creative expression led to the development of unique styles (such as bovine and leonine styles) and design elements (architectonic, thereomorphic and anthropomorphic) that would come to vary, not only between the social classes, but also chronologically. Underlying apotrapaic functions and mythological beliefs were combined with structural functionality and practical utility, creating a duality between the tangible physical and the supernatural divine. These elements would become so recognisable that they would stand as key role players within the stylistic analysis of furniture items and the establishment of a relative chronology of ancient Egyptian furniture. Thus said, the combination of distinctive

features (styles and designs) remains the most insightful area of study when tracing the evolutionary development of furniture.

A number of items stood within the ancient carpenter's repertoire, ranging from everyday utilitarian wares to royal showpieces. Although some technical and aesthetic differences did occur, between common and royal items, the basic functions remained unchanged across the social strata. Although these basic functions remained relatively unchanged, technical changes occurred predominantly as a result of new and improved tools and manufacturing techniques. These developments led to the evolution of individual furniture items.

Beds developed from humble straw mats and wooden planks to durable frames with strong supports. New technologies made comfort an achievable goal, while hinge mechanisms and folding beds brought palace comfort to the field. Downward sloping beds, curved frames, papyrus umbels, shortened side rails, etc, can all be used as chronological markers alongside other period specific features such as footboards, bedsprings, leonine legs, support straps and unique decorations.

The most commonly used everyday item, the stool, gave rise to the development of the folding stool, the chair and the throne. From primitive stool-like wooden stumps, to the graciously carved leonine stools of royalty, this utilitarian item grew in height, developing a backrest and slowly evolving into the chair. These developments were by no means linear, in that one item completely replaced its predecessor, but rather represented an overlapping of styles. Once again certain elements provide chronological markers and include the adoption of rounded and flared legs, cavetto cornices, torus mouldings, concave seats and decorative lattice work. From curved duck's head legs and artificial animal print seat covers, folding chairs came to represent more than just utilitarian functionality, but also social standing and military success.

Chairs ranged from heavy, over-sized items to light-weight, papyrus covered, versions. From seemingly uncomfortable straight-backed, solid seated designs, to items

boasting a combination of curved backs, concave seats and padded cushions. The large surface area of chairs, provided by backrests, arm supports and seats, gave rise to the incorporation of extravagant inlays, gold plating and delicate carvings. The increasing height of chairs, in general, gave rise to the development of footboxes and footstools, providing added comfort to the user.

Boxes represented some of the most commonly used furniture items, ranging from simple rectangular boxes with flat, removable lids to lavishly decorated versions with cavetto cornices and torus mouldings, capped by domed, hinged lids. From wig boxes and linen chests, to cosmetic and jewellery boxes, all these items remained utilitarian and functional, despite their highly aesthetic nature. Other utilitarian items included bed canopies, screens, curtain boxes and tables, of which the latter never truly gained popularity among the general public.

Furniture items evolved structurally due to improved manufacturing techniques, while aesthetic development occurred through the increased availability of inlay materials. With technical prowess came the freedom to experiment with elaborate designs, allowing furniture from later periods to be sound in both structural and aesthetic arenas. Social, cultural and economic developments in turn led to a change in art and iconography, causing certain styles to prevail over others[242].

From our research it became clear that items of furniture can be placed within a relative chronology based upon a stylistic analysis of various elements including: leg design (bovine, leonine or straight), support cone shape and size, backrest height and decorative elements (gold foil, semi-precious stones, ivory, faience, glass, etc). Through our investigation of thereomorphic and anthropomorphic designs it became apparent that symbolic elements permeated the furniture industry, both in the structural and decorative arenas.

[242] The best example being the dominance of leonine styles over bovine styles. This occurred as the focus moved from agriculture and local self-sustainability to imperial expansion and royal grandeur.

Period specific changes did occur, but the core character and unique identity of ancient Egyptian furniture remained fundamentally unchanged. From the grandiose and bold styles of the Old Kingdom, to the more modest versions of the Middle Kingdom, the height of Egyptian furniture was skilfully reached during the New Kingdom, when both modesty and royal extravagance could be mastered in equal effect by carpenters of the time.

In conclusion, a number of non-destructive imaging techniques, that aid modern researchers in revealing the underlying condition of delicate artefacts, were discussed. We learned that a number of techniques can identify subsurface imperfection, voids and areas of decay, while other imaging methods can reveal construction methods, such as the use of metal pins, nails and brackets.

With the aid of these technologies we now have various methods to confirm theories regarding construction without the need for conducting potentially damaging sampling and testing strategies. We are now able to uncover structural features and construction techniques unknown to us in previous years.

We identified some of the main culprits or agents of decay, allowing us to identify both microbial and non-microbial deterioration. We also discovered how the ancients protected their furniture from these elements and how modern researchers can use new chemicals to compliment ancient treatments. Finally, we addressed issues regarding moisture levels and problems regarding preservation environments in an attempt to establish ideal conditions for the continued preservation of ancient Egyptian furniture.

In conclusion, the discoveries we have made throughout this dissertation have provided us with a greater understanding of the ancient Egyptian furniture industry as a whole. Our knowledge of ancient raw materials, international trade, tools, production methods, ancient preservation, along with styles and designs, can now be applied to the modern-day fields of reconstruction and preservation. This in-depth understanding of an ancient trade will help us

to maintain authenticity when working with museum replicas, reconstructed items and preserved artefacts. In conclusion of our journey, we have gained a deeper appreciation of an industry that has become as recognised in the modern world as it was in the ancient world.

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APPENDIX A: TABLES

Author's note: *The information presented in the following tables has been adapted from Boardman et al (1976), Chaney & Basbous (1978), Corbett (2007), Davis (200d), Gale et al (2000), Goor (1965), Haldane (1993), Hepper (2009), Killen (1980), Leospo (1987), Lev-Yadun & Gophna (1992), Scott (1965), and Tapias et al (2004). Some examples of individual items are provided, but more extensive discussions on these items will feature in the later chapters.*

The basic differences between hardwoods and softwoods

SOFTWOODS	HARDWOODS
Low density: 400-600kg/cu m (25-37lb/cu ft)	High density: Up to 1000kg/cu m (651lb/cu ft)
Greater strength	Relative brittleness
Lightweight	Heavy
Less durable in wet or damp conditions	More resilient in wet or damp conditions
Prone to miss-form/contort, shrink and swell	Less flexible, more stable
Low resistance to insect attack	Higher resistance to insect attack
Low resistance to decay and rot	Higher resistance to decay and rot
Generally pale in colour	Ranging from light to very dark in colour
Open grained and easier to work with	Close grained and harder to work

Table 1

The durability of wood species, from the least to the most durable

LESS DURABLE	DURABLE
Alder	Teak
Birch	Iroko
Lime	Afrormosia
Ash	Jarrah
Popular	Chestnut
Spruce	Oak
	Cedar

Table 2

The density of wood species, from the least to the most dense

SOFTWOOD	TEMPERATE HARDWOOD	TROPICAL HARDWOOD
Western red cedar	Basswood	Obeche
Spruce	Poplar	Agba
Hemlock	Alder	Meranti, idigbo
Scots pine	Sycamore, ash	Mahogany, abura
Douglas fir	Elm, chestnut	Iroko, muninga
Larch	Walnut, cherry	Utile, sapele
Parana pine	Beech, birch	Teak
Pitch pine	Oak, rock maple	Afrormosia
Yew	Jarrah	Ebony

Table 3

Tree	Common name	Biological name	Variant Species	Wood type
	Acacia	Leguminosae-Mimosoidae	*Acacia tortilis* *Acacia nilotoca* *Acacia albida* *Acacia senegal* *Acacia seyal*	Dicotyledonous Hardwood
Examples from Ancient Egypt: 1st Dynasty: 3100-2890 BC couch frame made from acacia. 17th/18th Dynasty: table, arrow fragments. 17th/18th Dynasty: 1567 BC table, 25 inches long, acacia inlaid with box. 18th Dynasty: fragments from a chariot. 18th Dynasty: a small plaque of sculptured acacia, as well as a headrest, from the tomb of Harmhabi.				

Table 4

Tree	Common name	Biological name	Variant Species	Wood type
	Field maple	Aceraceae	*Aceraceae platanoides* *Aceraceae cappadocicum* *Aceraceae pseudoplatanus*	Dicotyledonous Hardwood
Examples from Ancient Egypt: 18th Dynasty: chariot platform.				

Table 5

Tree	Common name	Biological name	Variant Species	Wood type
	Common box	Buxaceae	*Buxus sempervirens* *Diospyros ebenum*	Dicotyledonous Hardwood
Examples from Ancient Egypt 17th-18th Dynasties: inlays. 17th Dynasty: a chair made from cypress, box and ebony, 12 inches high, from the tomb of Ramose. 18th Dynasty: chair, razor handle, and inlays.				

Table 6

Tree	Common name	Biological name	Variant Species	Wood type
	African black or iron wood, ebony	Leguminosae-Papilionoidae	*Delbergia melanoxylon* *Diospyros ebonum* *Diospyros mespiliformis*	Dicotyledonous Hardwood
Examples from Ancient Egypt: 17th Dynasty: a chair made from a dark reddish hardwood veneered with ebony and ivory. 18th Dynasty: staff, shabti figures from Amenhotep III, small statuettes, a door panel and fragments from a shrine. 18th Dynasty: the “Child’s Chair”, from the tomb of Tutankhamun, is made from ebony and ivory, with golden panels on the armrests. 18th Dynasty: a dummy folding stool from the tomb of Tutankhamun, made from ebony, ivory and gold. 18th Dynasty: ebony senet boardgame from the tomb of Tutankhamun. 18th Dynasty: portable wooden chest with ebony, ivory, gold leaf and copper alloy, from the tomb of Tutankhamun. 18th Dynasty: box in the shape of a cartouche made form wood, ebony and ivory, from the tomb of Tutankhamun. 18th Dynasty: the restored cosmetics chest of Princess Sithathoryunet, made from ebony ivory, faience, carnelian, gold and silver, in the shape of a shrine. 18th Dynasty: an elaborate wooden chest inlaid with ebony, white- and pink-dyed ivory, turqoise faience and gold, with gilded wooden figures, from the reign of Amenhotep III, found in the tomb of Yaya and Tjuya. 18th Dynasty: according to the Amarna letters, Amenhotep III sent a headrest, four beds, six chairs, and ten footstools, all crafted from ebony to the king of Babylonia, along with thirteen ebony chairs and 100 pieces of ebony to the king of Arzawa. 18th Dynasty: the leg of a campstool from the tomb of Harmhabi. 18th Dynasty: handle of a battle-axe from the tomb of Thutmose IV.				

Table 7

Tree	Common name	Biological name	Variant Species	Wood type
	Common ash	Oleaceae	*Fraxinus excelsior* *Fraxinus syriaca*	Dicotyledonous Hardwood
Examples from Ancient Egypt: 18th Dynasty: composite bow from the tomb of Tutankhamun, as well as the base and axle of a chariot.				

Table 8

Tree	Common name	Biological name	Variant Species	Wood type
	Walnut	*Juglandeae*	*Juglans regia* *Juglans orientis*	Dicotyledonous Hardwood
Examples from Ancient Egypt: 18th Dynasty: the chair of Princess Sitamun was crafted from a less valuable wood and veneered with what is most probably walnut.				

Table 9

Tree	Common name	Biological name	Variant Species	Wood type
	Olive	Oleaceae	Olea europaea	Dicotyledonous Hardwood
Examples from Ancient Egypt: Late Period: numerous stelae.				

Table 10

Tree	Common name	Biological name	Variant Species	Wood type
	Tamarisk	Tamaricaceae	*Tamarix aphylla* *Tamarix jordanis* *Tamarix nilotica*	Dicotyledonous Hardwood
Examples from Ancient Egypt: New Kingdom: statuette of Osiris, wooden pegs and dowels, stele, coffins and coffin pegs, as well as numerous headrests of acacia and tamarisk bands. 17th Dynasty: coffin dowels. 17th Dynasty: stool with rush seat. 18th Dynasty: box lid, flange of a chariot wheel, bed, chair. 18th Dynasty: 1450 BC model or toy of a folding bed, painted and finished off complete with linen 'springs'. 18th Dynasty: carpentry adze with a Tamarisk handle and bronze blade. 18th Dynasty: 1500BC Tamarisk chair.				

Table 11

Tree	Common name	Biological name	Variant Species	Wood type
	Turkey oak	Fagaceae	*Quercus cerris* *Quercus aegilops* *Quercus calliprinos*	Dicotyledonous Hardwood
Examples from Ancient Egypt: New Kingdom: dowels, tomb models and coffin lid.				

Table 12

Tree	Common name	Biological name	Variant Species	Wood type
	Sycamore Fig	Moraceae	*Ficus sycomoris* *Ficus carica*	Dicotyledonous Hardwood
Examples from Ancient Egypt: 17th Dynasty: stele and coffins. 18th Dynasty: two 1500 BC linen chests belonging to Hat-nufer, one made of painted Sycamore and the other of Pine. 18th Dynasty: coffin and model building cradles from the foundation deposits under the tomb of Queen Hatshepsut, as well as miniature coffins. 18th Dynasty: painted sycamore figure of a serpent goddess from the tomb of Amenhotep II.				

Table 13

Tree	Common name	Biological name	Variant Species	Wood type
	Sidder (*nabk*) or Christ's thorn	Rhamnaceae	*Ziziphys spina-Christi* *Ziziphys mucronata*	Dicotyledonous Hardwood
Examples from Ancient Egypt: 17th/18th Dynasty: stool, bow and dowels.				

Table 14

Tree	Common name	Biological name	Variant Species	Wood type
	Persea	Sapotaceae	*Mimusops laurifolia*	Dicotyledonous Hardwood
Examples from Ancient Egypt: New Kingdom: headrests.				

Table 15

Tree	Common name	Biological name	Variant Species	Wood type
	Elm	Ulmaceae	*Ulmus minor* *Ulmus nitens* *Ulmus carpinifolia*	Dicotyledonous Hardwood
Examples from Ancient Egypt: 18th Dynasty: yoke, handrail and various chariot parts from the tomb of Tutankhamun.				

Table 16

Tree	Common name	Biological name	Variant Species	Wood type
	Birch	Betulaceae	*Betula alnoides* *Betula carpatica*	Dicotyledonous Hardwood
Examples from Ancient Egypt: New Kindom: birch bark decorations applied to bows and staves.				

Table 17

Tree	Common name	Biological name	Variant Species	Wood type
	Dom or doum palm	Palmae	*Hyphaeane thebaica*	Monocotyledons Fibrous
Examples from Ancient Egypt: All periods: fibres used in cushion stuffing.				

Table 18

Tree	Common name	Biological name	Variant Species	Wood type
	Date palm	Palmae	*Phoenix dactylifera*	Monocotyledons Fibrous
Examples from Ancient Egypt: All periods: fibres used in cushion stuffing.				

Table 19

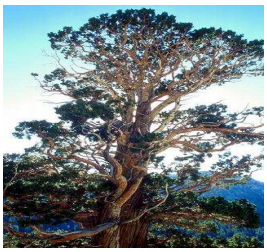
Tree	Common name	Biological name	Variant Species	Wood type
	Grecian juniper or Eastern savin (*Dapranu: Assyrian*)	Cupressaceae	*Juniperus excelsa* *Juniperus phoenicea* *Juniperus drupacea*	Gymnosperms Softwood
Examples from Ancient Egypt: New Kingdom: coffins.				

Table 20

Tree	Common name	Biological name	Variant Species	Wood type
	Pine	Pinaceae	*Pinus halepensis* *Pinus pinea*	Gymnosperms Softwood
Examples from Ancient Egypt: 11th Dynasty: carpentry square from around 2100 BC. 18th Dynasty: model brick mould and coffins. 18th Dynasty: 1500 BC Pine chest with a double pitched lid, painted white inside and out, standing on four short legs. 18th Dynasty: fragment of a wooden box from the tomb of Thutmose IV. 18th Dynasty: two white-washed clothes chests from the tomb of Nefer-khewet.				

Table 21

Tree	Common name	Biological name	Variant Species	Wood type
	Cypress (*Meru*[243]*: Egyptian) Burasu or Surmenu: Assyrian*)	Cupressaceae	*Cupressus sempervirens*	Gymno-sperms Softwood
Examples from Ancient Egypt: 18th Dynasty: small jewelery box with a lid of tamarisk and inlays of boxwood and fiance.				

Table 22

Tree	Common name	Biological name	Variant Species	Wood type
	Cedar of Lebanon (*Ash: Egyptian*) (*Erenu: Assyrian*) (*GIS.ERIN.MEs: Sumerian*)	Pinaceae	*Cedrus libani* *Cedrus atlantica* *Cedrus brevifolia* *Cedrus stenocoma*	Gymnosperms Softwood
Examples from Ancient Egypt: 12th Dynasty: cedar of poor quality covered with cedar veneer of a much higher quality. 2nd Intermediate: 1795 BC cedar cosmetic chest, veneered with ebony and ivory. 18th Dynasty: shrines and dowels, wood specimens from within the stone sarcophagus of Tutankhamun. 18th Dynasty: throne of Tuthmosis IV, made of cedar and overlaid with gold. 18th Dynasty: the Tomb of Harmhabi contained numerous items made of cedar, although not all of these were items of furniture. These include statues of Anubis, Horus, a seated god, a Hathor-cow figure, a lion, panther, two hippopotamus heads, three jackals, hawks, and a single swan. 18th Dynasty: a casket made of unidentified wood covered with panels of cedar wood, painted red on the outside, and framed with strips of ebony veneer, as well as a cedar wood coffin, all from the tomb of Queen Tiyi. 18th Dynasty: panel from the side of a throne belonging to Thutmose IV, with scenes and inscriptions carved on both surfaces. Also found were fragments from the back of a throne, carved in cedar with fine ornamentation modelled in Stucco, along with the cedar handles of two wooden fans and a few fragments of carved wood, bolts and spoons. 20th-26th Dynasties: coffins and stelae.				

Table 23

[243] *Meru* can mean Cypress or Juniper (Kuniholm 1997: 347).

Chemical compositions

Name/Formula	Natural composition	Imitation composition
Dark blue (lapis lazuli): $(Na,Ca)_8(AlSiO_4)_6(S,SO_4,Cl)_{1-2}$.	Lazurite, feldspathoid silicate, sodium, aluminum, silicon, sulphur and chloride.	Feldspar, flint, fine white sand, sodium carbonate, sodium bicarbonate, whiting, bentonite, copper oxide, potassium, antimony, cobalt, copper
Green-blue (turquoise): $CuAl_6(PO_4)_4(OH)_8 \cdot 4H_2O$.	Hydrous phosphate of copper and aluminium.	Manganese or iron compounds sodium bicarbonate, potassium, antimony, cobalt, copper
Red (carnelian): SiO_2.	Silica, chalcedony, iron oxide.	Iron oxide, sodium bicarbonate, copper

Table 24[244]

[244] Table adapted from Taniguchi et al (2002), Gorman (2002), Mao (2000), Mulford (1982) and Noble (1969).

APPENDIX B: COLOUR PLATES

PLATE 1

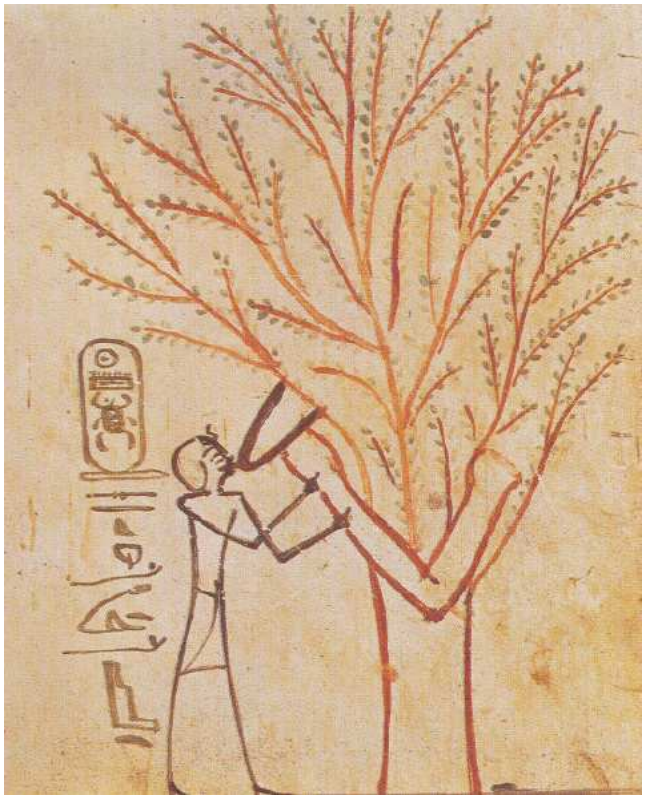


PLATE 2

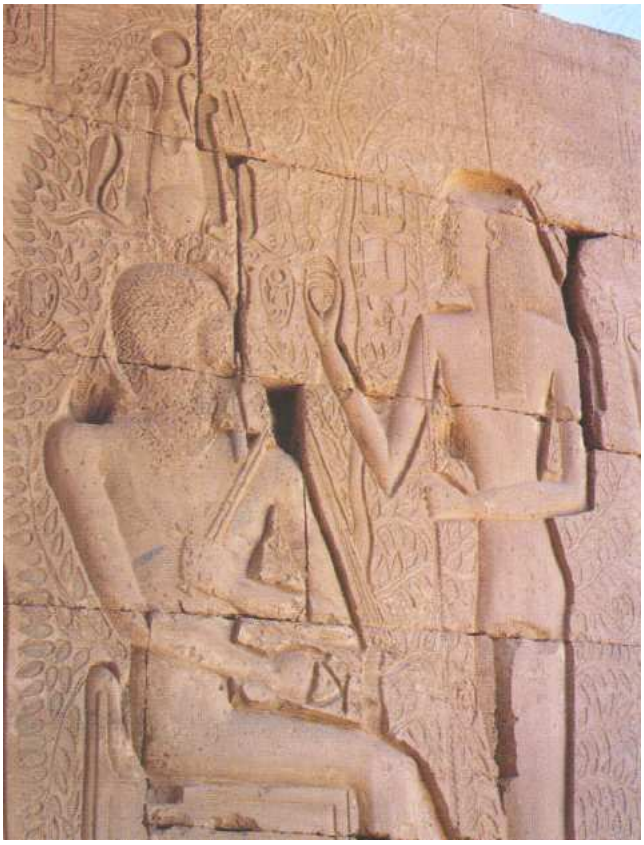
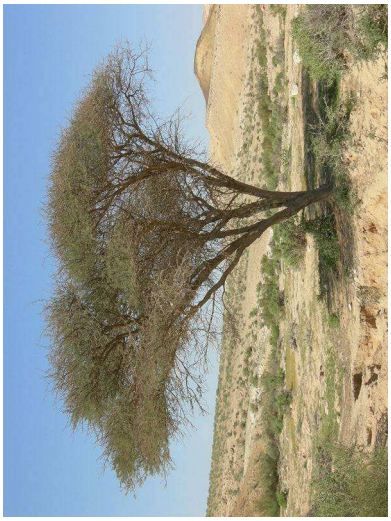


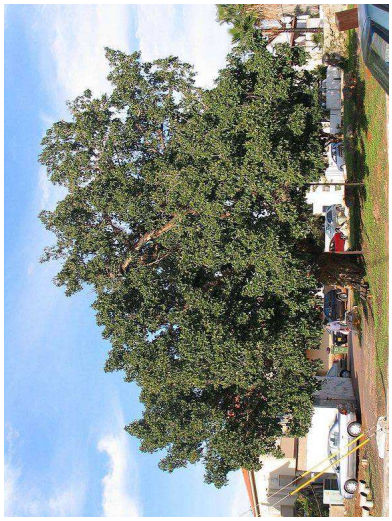
PLATE 3

PLATE 4

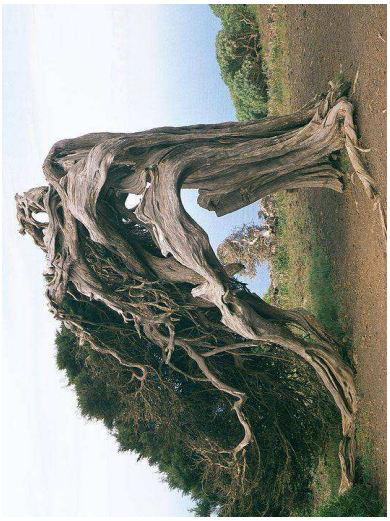


Acacia

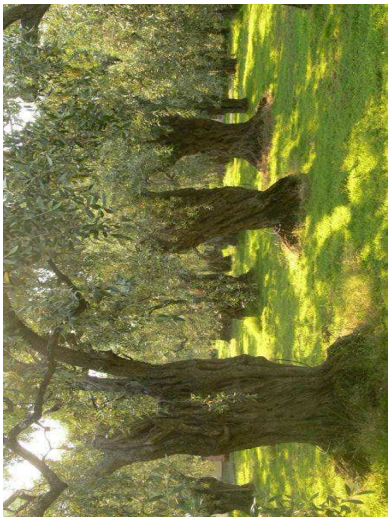
Acacia tortilis



Sycamore



Juniper



Olive

Field maple

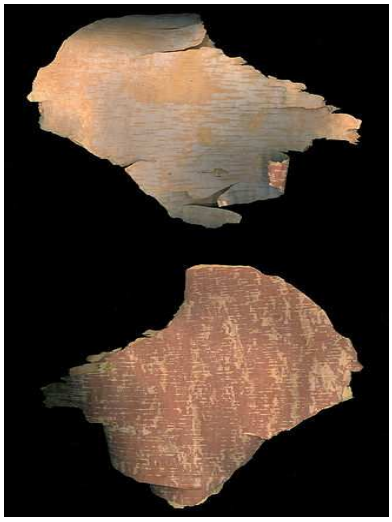
Common ash

Common box

Turkey oak

PLATE 5

Acacia



Birch (bark)

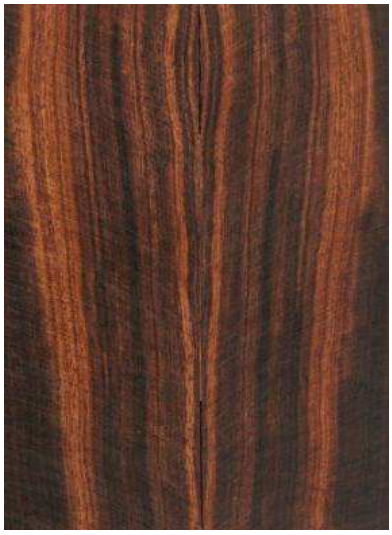
Tamarisk

Common ash

Common box

Maple

Striped ebony



Ebony

Dark ebony

PLATE 6

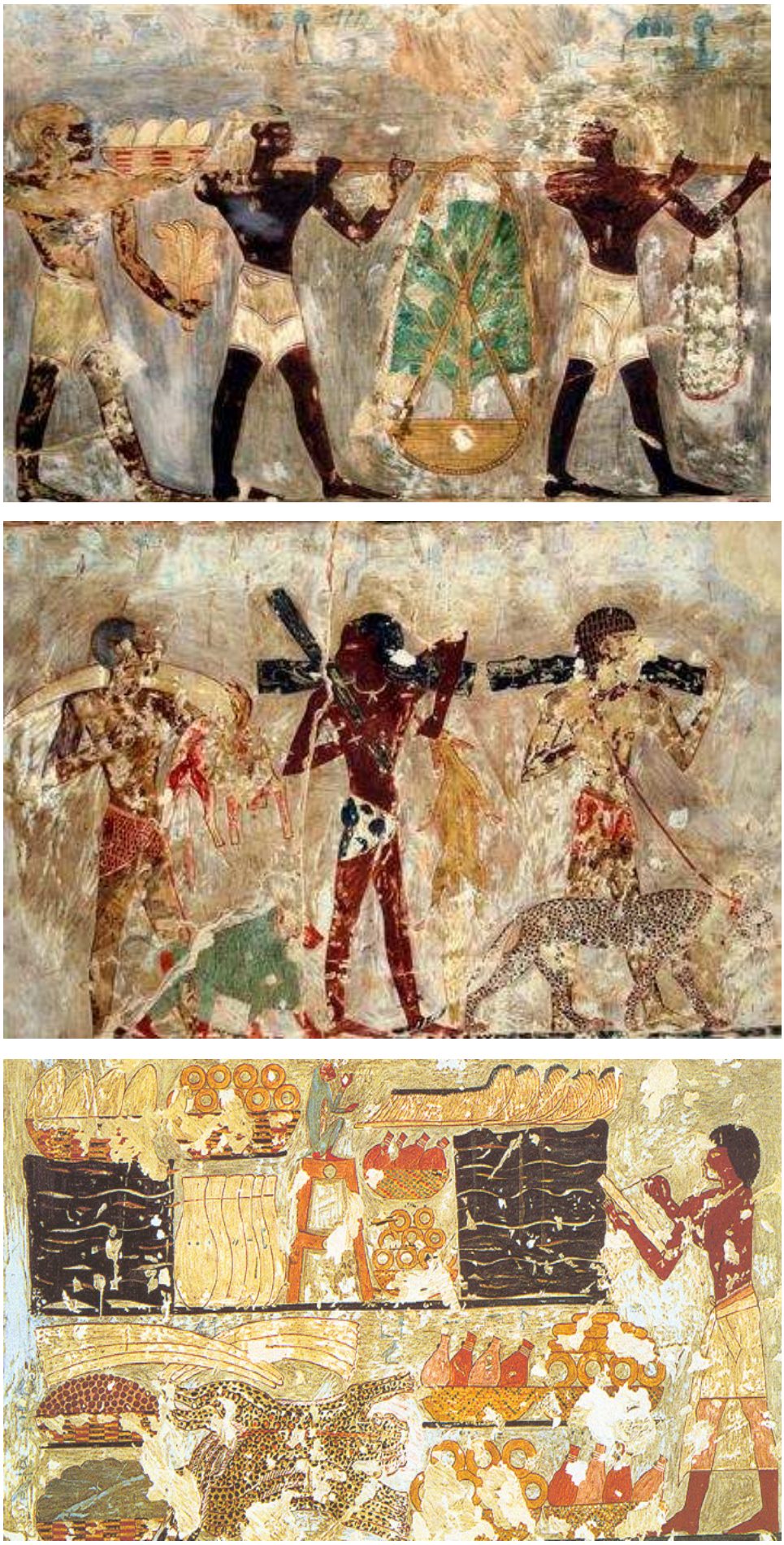


PLATE 7

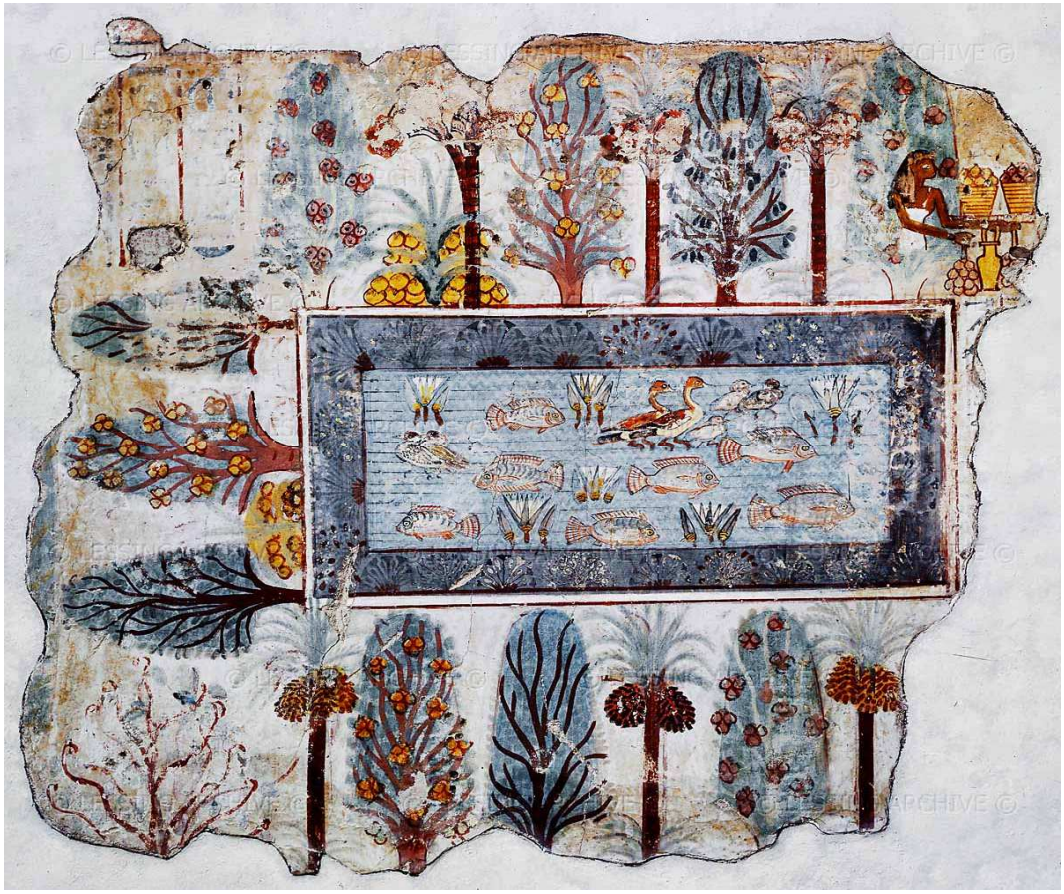


PLATE 8

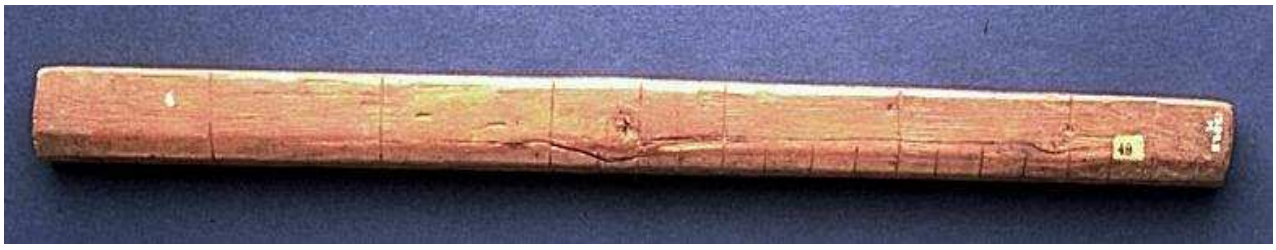
PLATE 9

Middle Kingdom cubit rods from Lahum and Abydos

PLATE 10

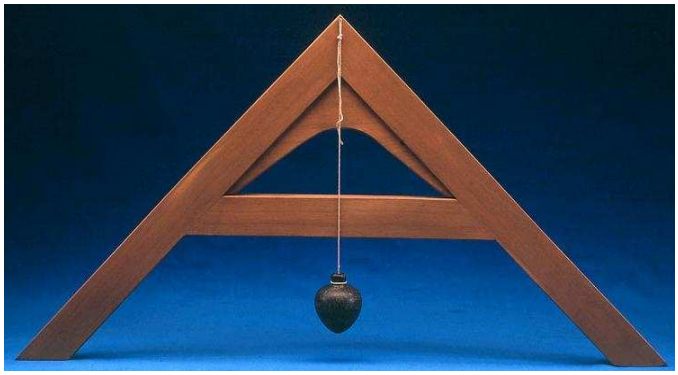
18th Dynasty cubit rod, tomb of Maya, treasurer of Tutankhamun

PLATE 11



20th Dynasty cubit rods

PLATE 12

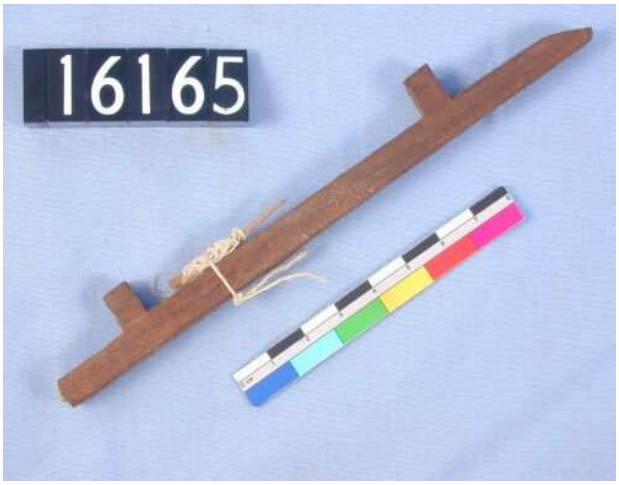


Plumb line from the 18th Dynasty used to level horizontally.

PLATE 13

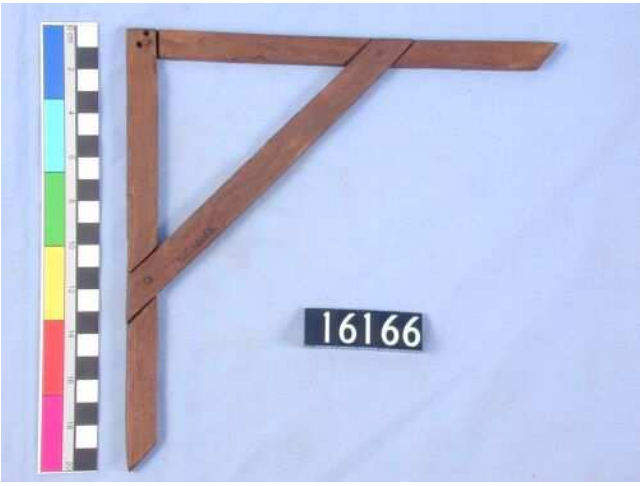
Plumb from the 19th Dynasty used to level vertically

PLATE 14



Model plumb line from the 19th Dynasty.

PLATE 15



Model square from the 9th Dynasty

PLATE 16

Square from the Ptolemaic Period site of Lahum

PLATE 17

Predynastic flint saws

PLATE 18

Bronze saw, 1st Intermediate Period

PLATE 19

Copper alloy saw, unknown period

PLATE 20

Pull-saws from the tomb of Hatshepsut.

PLATE 21

PLATE 22

2nd Dynasty

6th Dynasty

Unspecified period

Unspecified period

Unspecified period

Unspecified period

14th Dynasty

18th Dynasty

18th Dynasty

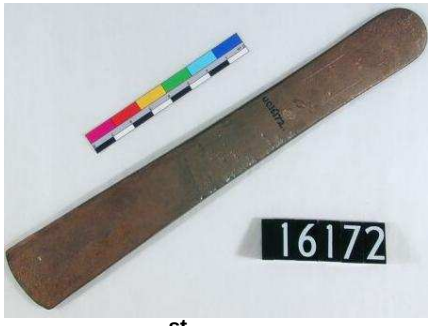
PLATE 23

PLATE 24

PLATE 25

PLATE 26

PLATE 27



Copper: 1st Dynasty

Copper 1st Dynasty

Copper alloy: 1st Dynasty

Copper: 4th Dynasty

Copper 4th Dynasty

Copper alloy: Old Kingdom

Copper: 12th Dynasty

Copper: 12th Dynasty

Bronze: 18th Dynasty

Iron: Roman Period

Iron: Roman Period

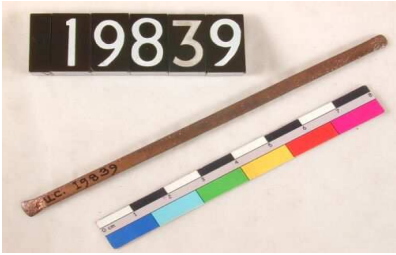
Socketed blade: 19th Dynasty

PLATE 28

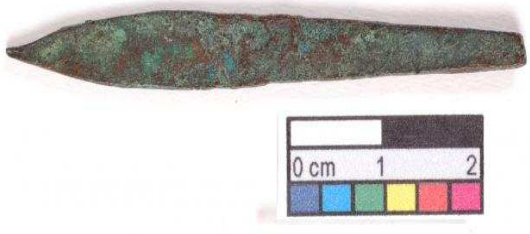
Copper: 1st Dynasty

Copper: Old Kingdom

Bronze: Unspecified period



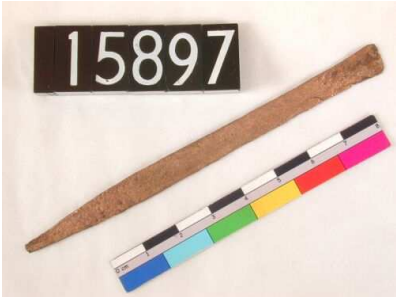
Copper alloy: Early Dynastic



Bronze: Middle Kingdom

Bronze: 18th Dynasty

Bronze: 18th Dynasty



Bronze: 18th Dynasty

Bronze: 18 Dynasty

Bronze: 18th Dynasty

Bronze: 18th Dynasty

Copper alloy: 18th Dynasty

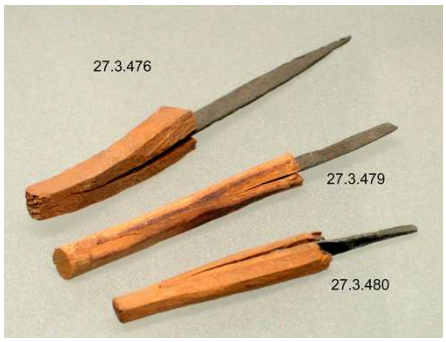
Model copper chisels: 18th Dynasty

PLATE 29

11th Dynasty **12th Dynasty**

Life size chisels from the temple of Hatshepsut

Model chisels from the temple of Hatshepsut



Model tools from the tomb of Senenmut, 18th Dynasty

PLATE 30

5th Dynasty

5th Dynasty

Mallet 5th Dynasty

12th Dynasty

12th Dynasty

12th Dynasty

Unspecified period

Unspecified period

Unspecified period

12th Dynasty

18th Dynasty

New Kingdom

Roman Period

Roman Period

Roman Period

PLATE 31

Granite: Barbarian Period

Various stone: 19th Dynasty

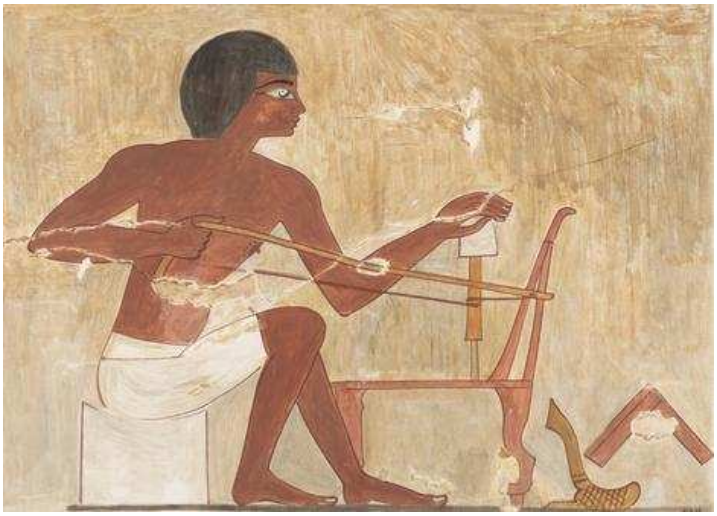
Iron: Roman Period

PLATE 32

Fragments of a bow drill and drill cap

PLATE 33

Nebamum tomb



Tomb of Rekhmire

Tomb of Rekhmire

PLATE 34

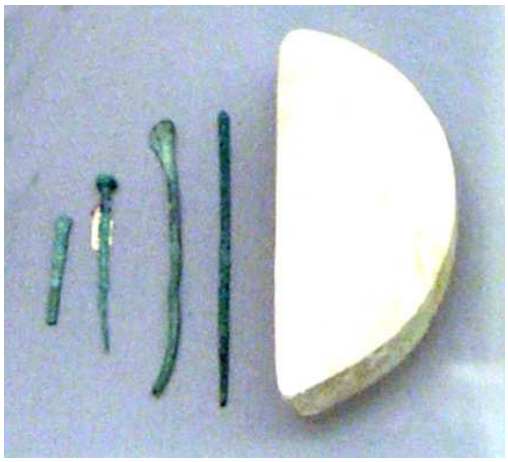
Bed corner bracket: Unspecified period. **Metal angle bracket: 26th Dynasty**

Inscribed metal angle bracket: 26th Dynasty

Wooden angle brackets: Middle Kingdom

PLATE 35

12th Dynasty



Middle Kingdom

Bronze: 18th Dynasty

19th Dynasty

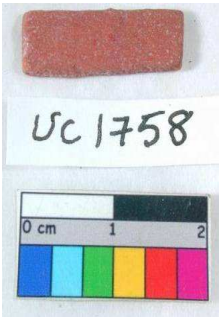
19th Dynasty

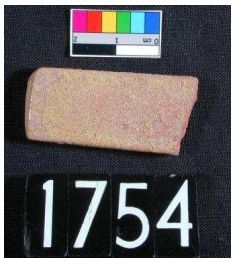
Bronze: Roman Period

Copper alloy: Roman Period

PLATE 36


Faience inlays: 12th Dynasty








Geometric faience inlays:
New Kingdom
Monochrome (Single colour)

PLATE 37

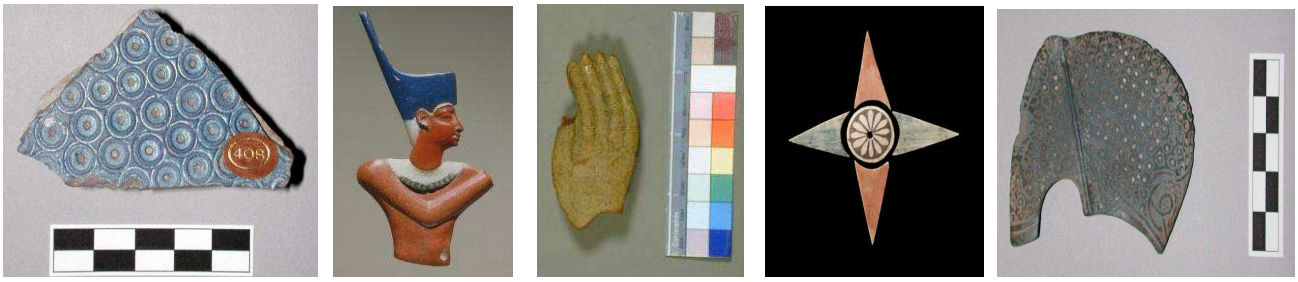
Floral faience inlays: New Kingdom. Polychrome (Multiple colours).

Mosaic style faience21st Dynasty

Shaped faience tiles: Ptolemaic

Multiple faience designs: Roman Period. (Polychrome)

PLATE 38



Glass and faience: 18th Dynasty – Roman Period

Bronze Bes head
18th Dynasty

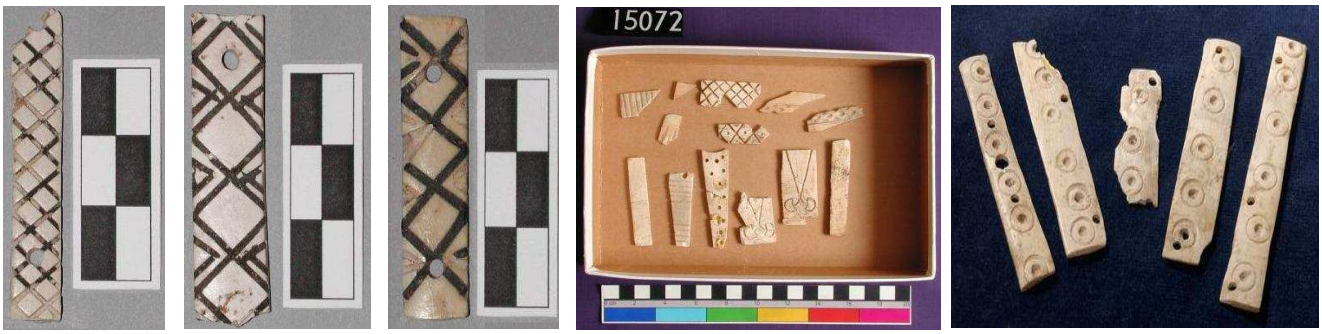
Steatite
New Kingdom

Chert
18th Dynasty

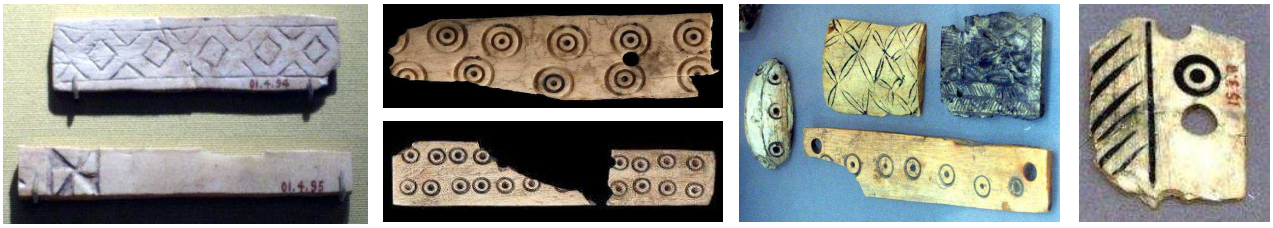
Mica tile
Meroitic Period

PLATE 39

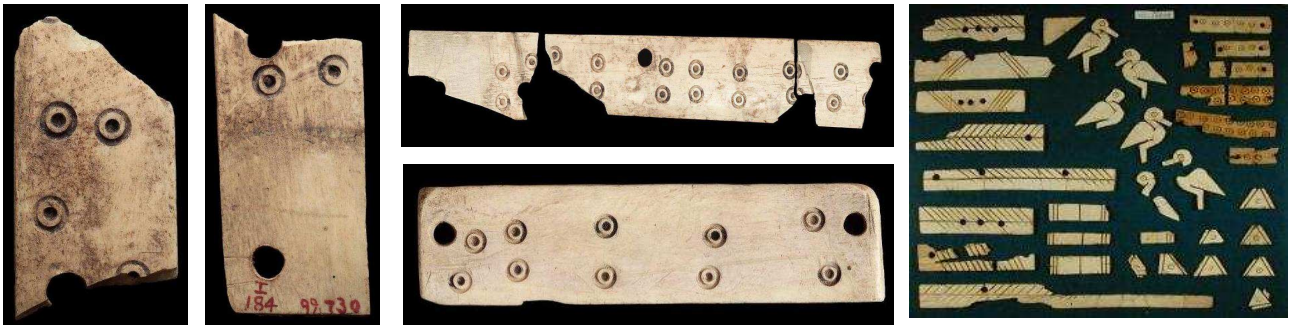
PLATE 40



Inlays from Abydos, 3000BC **Old Kingdom**



Old Kingdom **Middle Kingdom**



2n Intermediate

New Kingdom

PLATE 41

Nubian ivory inlays: 1700 – 1550 BC

PLATE 42

Wooden beam covered in gold foil
New Kingdom

Nubian furniture leg
New Kingdom

PLATE 43



Model leg, elephant ivory
Abydos, 1st Dynasty

Model leg, hippopotamus ivory



Miniature furniture legs, ivory
Abydos, 1st Dynasty

Model legs

Furniture leg, Tarkhan

A complete set of furniture legs

Early Dynastic

PLATE 44

Bovine leg, Old Kingdom

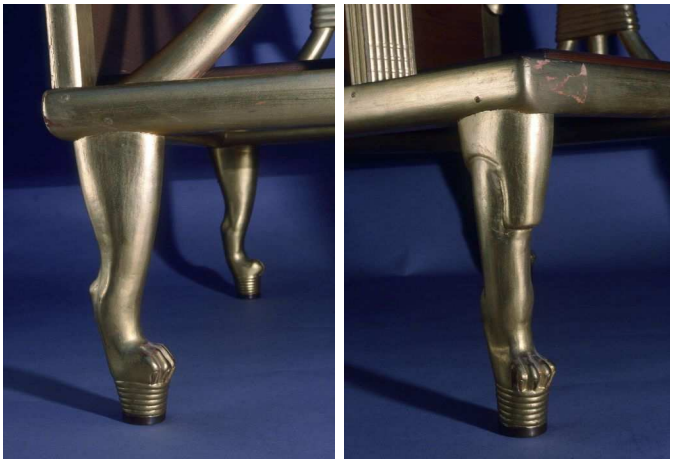
Bovine leg with herringbone hatching, Old Kingdom

Bovine furniture legs, 2008 – 1075 BC

Bovine furniture leg, Middle Kingdom

PLATE 45

PLATE 46



Chair of Hetepheres **6th Dynasty tomb of Mereruka**

PLATE 47

PLATE 48

Middle Kingdom/ Second Intermediate

Nubian furniture legs, 1700 – 1500 BC

Medinet Gurob, New Kingdom

New Kingdom

Possible chest legs, Mergissa, New Kingdom

New Kingdom

PLATE 49

18th Dynasty

Memphite region
12/13th Dynasty

Relief of Ashait
Middle Kingdom

Ebony chair
New Kingdom

Full-bodied style
New Kingdom

Beds from the tomb of Tutankhamun
18th Dynasty

Roman Period

Greece/Italy, 10 BC – 100 AD

PLATE 50

Middle Kingdom

New Kingdom

PLATE 51

Tarkhan
1st Dynasty

Gebelein
Old Kingdom

PLATE 52

The beds of Queen Hetepheres

PLATE 53

PLATE 54

12th Dynasty model bed

PLATE 55

Lahum
Middle Kingdom

Medinet Gurob
New Kingdom

Hawara
18th Dynasty

No period, possibly late
New Kingdom

Lahun
Roman Period

Rifeh
Roman Period

Hand carved legs
New Kingdom

PLATE 56

PLATE 57

PLATE 58

Full-scale folding bedstead of Tutankhamun

A fully functional model replica

PLATE 59

Predynastic **18th Dynasty**

PLATE 60

New Kingdom

Stool of Queen Hatshepsut, 18th Dynasty

Wicker seat stool, New Kingdom

PLATE 61

PLATE 62

PLATE 63

PLATE 64

PLATE 65

Dira Abu el-Naga
Middle Kingdom

Stool with removable leather seat
New Kingdom

Stool of the lady ly-Neferti
Deir el-Medineh
19th Dynasty

18th Dynasty

PLATE 66

New Kingdom

PLATE 67

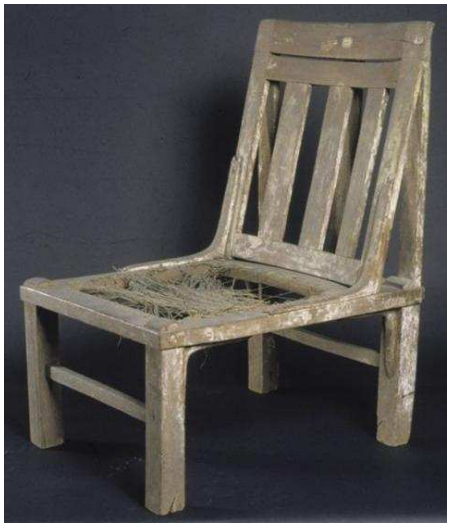


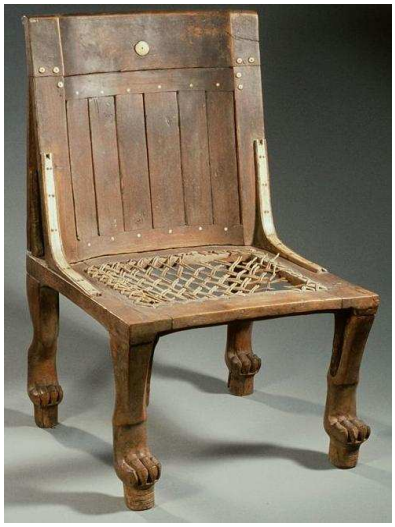
PLATE 68


PLATE 69


PLATE 70

PLATE 71





New Kingdom **18th Dynasty**

18/19th Dynasty **Chair of the architect Kha, 18th Dynasty**

PLATE 72

18th Dynasty

The chair of Hatnofer
18th Dynasty

18th Dynasty

PLATE 73

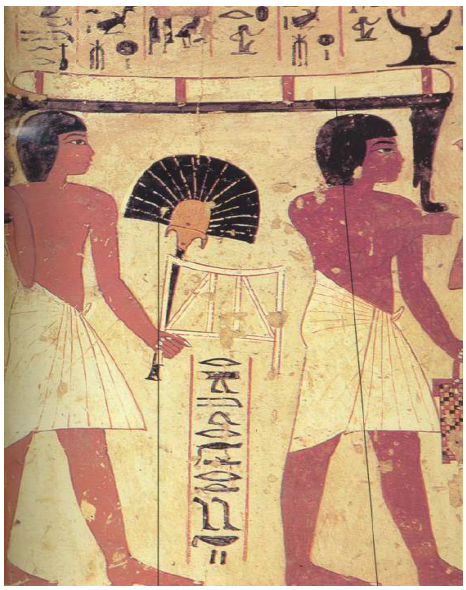
PLATE 74

PLATE 75

PLATE 76

PLATE 77

PLATE 78



Tomb of Ramose
18th Dynasty

Tomb of Rameses III
18th Dynasty

Rameses III
18th Dynasty

Horemheb
18th Dynasty

18th Dynasty

PLATE 79

PLATE 80

PLATE 81

PLATE 82

PLATE 83

PLATE 84

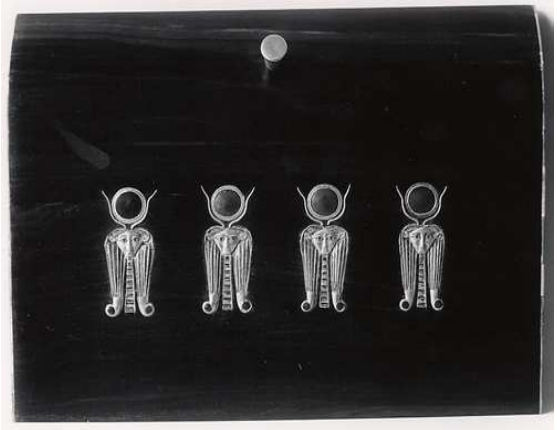



PLATE 85



PLATE 86


Chest of Kubaniya, 12th Dynasty

Lahun, Middle Kingdom **Middle Kingdom**

PLATE 87


PLATE 88


PLATE 89

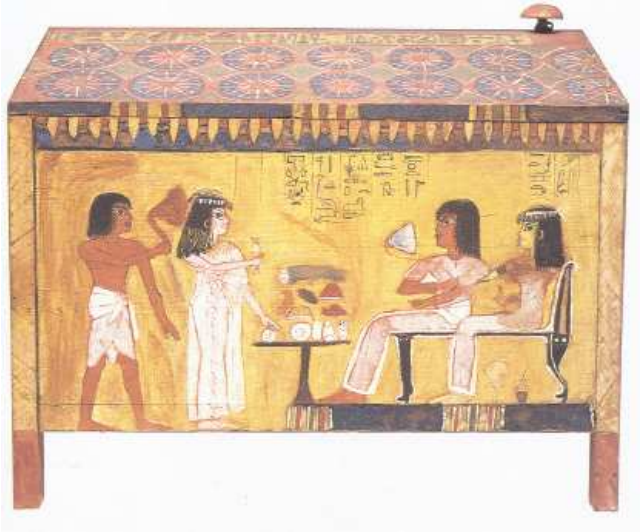



PLATE 90


PLATE 91


PLATE 92

PLATE 93

PLATE 94

PLATE 95

PLATE 96

PLATE 97

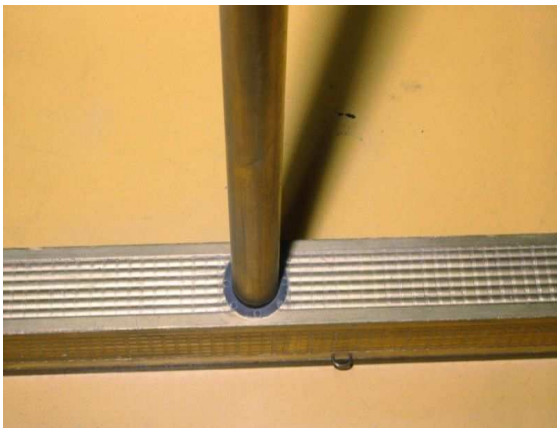
PLATE 98

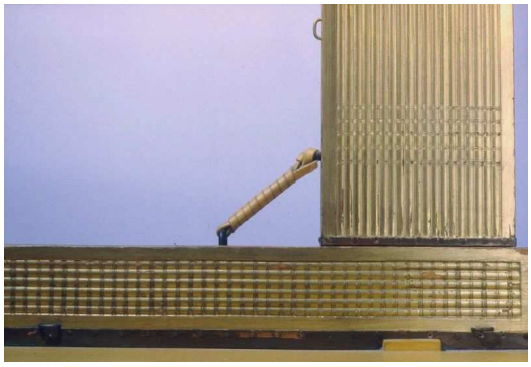
PLATE 99

PLATE 100

PLATE 101

PLATE 102





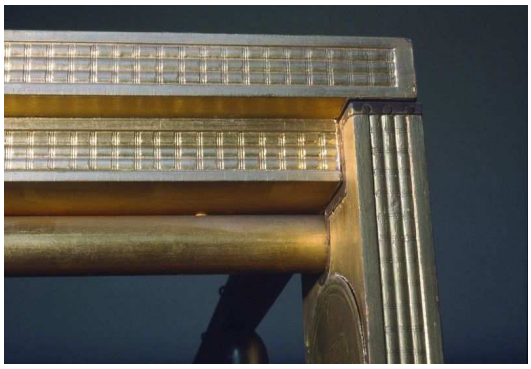


PLATE 103

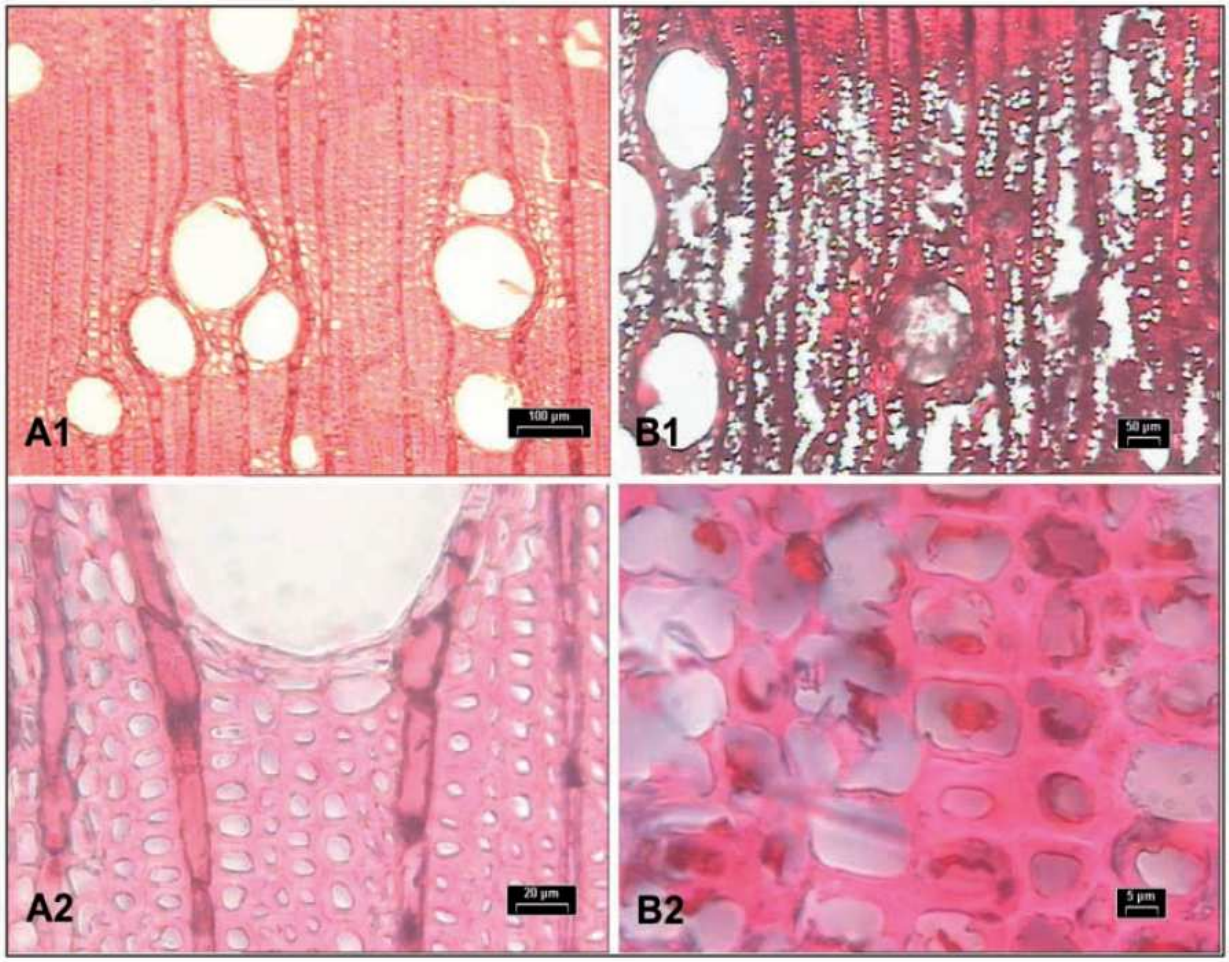


PLATE 104

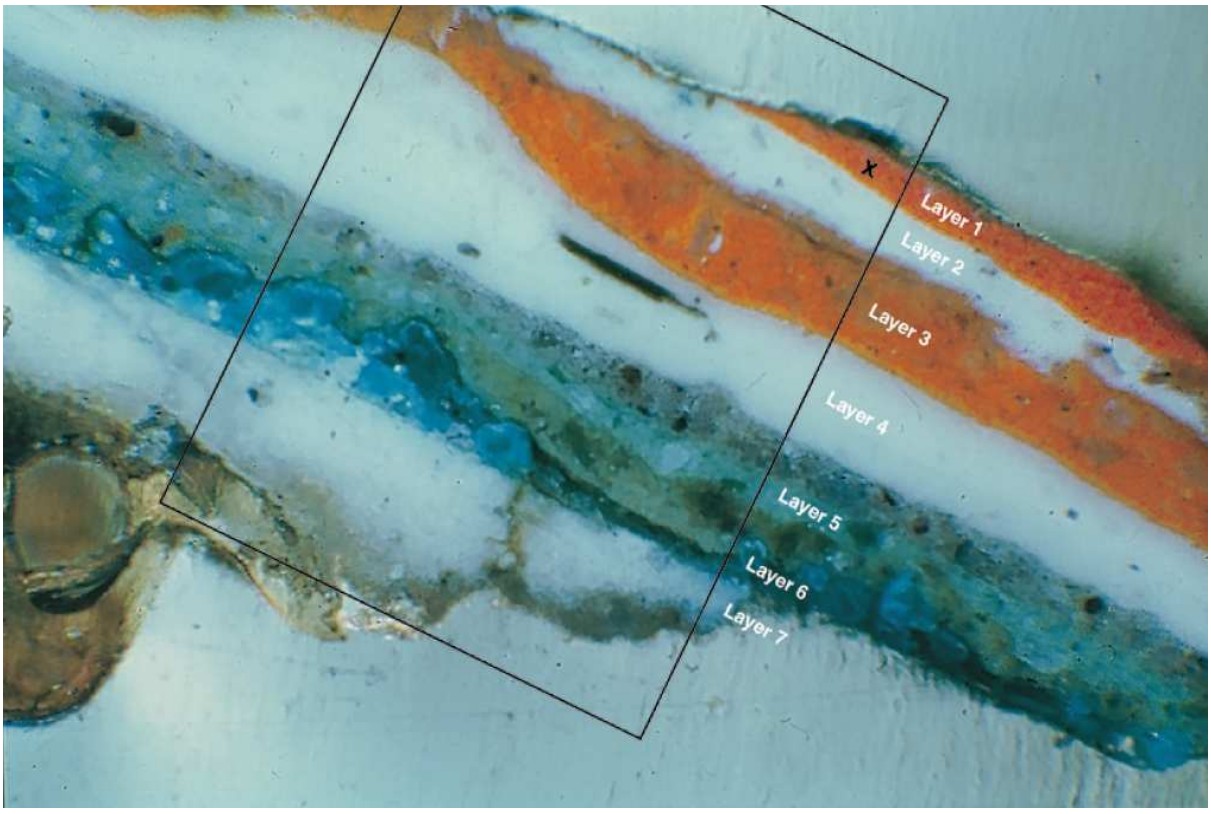


PLATE 105

PLATE 106

APPENDIX C: IMAGE AND PLATE BIBLIOGRAPHY

IN-TEXT IMAGES

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39. Quibell 1913. Plate XVIII.
40. Quibell 1913: Plate XX.
41. Killen 1980: Plate 38.
42. Killen 1980: Plate 39.
43. Killen 1980: Plates 45 & 46.
44. Killen 1980: Plates 68, 69 & 70.
45. Killen 1980: Plate 71.
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48. Quibell 1913: Plate XVIII.
49. Killen 1980: Plate 51-53.
50. Killen 1980: Plate 49.
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52. Killen 1980: Plate 78.
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