STUDIES IN DENDRO-EGYPTOLOGY:
THE LABORATORY OF TREE-RING RESEARCH EGYPTIAN WOODEN COLLECTION

by

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STATEMENT BY THE AUTHOR

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APPROVAL BY RESEARCH COMMITTEE

As members of the Research Committee, we recommend that this thesis be accepted as fulfilling the research requirement for the degree of Master of Science.

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ABSTRACT

There is an urgent need to establish a dendrochronological record for ancient Egypt. I have chosen this topic in order to explore the possibility of establishing a master chronology from ancient Egypt. This study focuses specifically on dendrochronological analyses of ancient Egyptian artifacts and will identify the main types of wood resources with the highest dendrochronological potential for ancient Egyptian periods. This study concerns the practicalities for building a tree-ring chronology for ancient Egypt, introduces a need for a Dendro-Egyptological approach which uses the principles of dendrochronology in combination with Egyptology, and draws parallels with dendroarchaeological research across the United States. This study starts out by shedding light on the past work of dendrochronology and dendroarchaeology in Egypt. Then wooden samples in the Laboratory of Tree-Ring Research (LTRR) are examined with a reference to the Arizona State Museum (ASM) Egyptian wooden collection. The LTRR data set is conducted to reveal any implications for Dendro-Egyptology and interpret evidence for early timber trade in ancient Egypt. Then this study concludes with a discussion of the future directions for Dendro-Egyptology. The goal of this thesis is to provide a framework for developing Dendro-Egyptology.
Chapter 1

Introduction

Dendrochronology, the science of dating tree rings, was developed in the dry environment of the American Southwest when tree-ring research was used in combination with archaeological data to understand the timing past human and environment interactions (Bannister et al. 1998: 311; Cowie 2013; Dean 1996; Douglass 1929; Haury 1935: 98; 1962; Judd 1962; Nash 1998: 261-263; 1999; 2000; Nash and Dean 2005; Reid and Whittlesey 2005; Schweingruber 1988; Speer 2010; Touchan and Hughes 2009; Webb 1983). Since that development, a similar pattern has been repeated in archaeological contexts all over the world (Bannister 1970: 1), and dendroarchaeology has become a discipline in its own right. In the Mediterranean area (Rich 2013) considerable progress has been made in constructing long tree-ring chronologies and using tree-rings to date sites and buildings (Cichocki et al. 2004: 840; Kuniholm and Striker 1987; Lev-Yadun 1992; Lev-Yadun et al. 1996; Liphschitz 1986; Touchan et al. 1998). In Egypt (Figure 1.1) where the potential is promising, however, very little dendrochronological work has been conducted. The goal of this thesis is to provide a framework for developing dendro-Egyptology. I begin by analyzing Egyptian wood and artifacts housed at the LTRR and ASM. If these samples are appropriate tree species, and retain other attributes of dendrochronologically useful species (Ahlstrom 1985; Speer 2010; Towner 2002).

Dendrochronology is not well-known in Egypt for a number of reasons. Archaeologists still rely on Egyptian chronologies (see appendix) based on ancient textual sources such as Egyptian Royal Annals, the Royal Canon of Turin, King Lists and Manetho’s Aigyptiaka, (see Hornung et al. 2006). Classical and Near Eastern archaeologists also rely on textual evidence (for
Near Eastern texts, see Kitchen 2013); and do normally apply other dating techniques such as radiocarbon (Bronk Ramsey 2013: 29-30).

Figure 1.1: Map of Egypt showing archaeological sites (mainly based on Baines 2013)

The material culture of Egypt, such as the Pyramids, the Great Sphinx at Giza, mummies, and treasures of the golden King Tutankhamun, has captivated the world and inspired generations of archaeologists, and is simply, in many cases, too precious and sacred to be used for dendrochronological analysis. The potential of other materials (structural timbers, etc.) has
not yet been realized because the technique is not widely known in Egypt and training is not provided for field archaeologists. It is very strange that although dendrochronology was invented in Arizona decades ago, it is still not common in Egypt (Cichocki 2006: 365-366). The reason for this is mainly due to the fact that some Egyptologists believe that Egyptian chronology is stable and accurate, although that is not really the case (Shaw 2000; Hornung et al. 2006; Kitchen 2013).

To follow the model of Douglass, Bannister, and American southwestern archaeology in general (Bannister 1962; Bannister and Robinson 1975; 1992; Cordell and Fowler 2005; Dean 1978; Douglass 1929; Haury 1935: 98-99; 1962; 1994; Reid and Whittlesey 2005), the beginnings of a tree-ring record for Egypt should logically be rooted in long-lived trees that are growing in the larger region today (compare Dunwiddie 1979). Some potential for this lies in the long lived Juniperus phoenicea of the Sinai Peninsula (El-Bana et al. 2010; Shmida 1977), some of which have been shown to live for more than 800 years, but their rings are often very difficult to analyze. I might be able to cross-match such samples with material from other areas — e.g. Jordan (Touchan et al. 1998), but that has yet to be attempted.
Applying dendrochronology to Egyptian material culture has encountered some problems. Cedar and juniper have been successfully crossdated, both long lived trees that grow near each other in places such as the mountains of Lebanon, the Taurus Mountains of Turkey, and Cyprus (Kuniholm et al. 2007; Kuniholm et al. 2014: 94). Indigenous Egyptian wood (Figure 1.2) such as sycamore, tamarisk, and acacia depend on the water flow in neighboring canals rather than on prevailing climate (Kuniholm et al. 2014:94). In most museum collections of Egyptian artifacts, the word “wood” is used in description rather than identifying the exact
species names (Bassir 2013). The labels for Egyptian wooden artifacts is often written as “wood” without identifying wood species. It seems that Egyptologists probably think that all kinds of indigenous wood are the same. Most of Egyptian wooden artifacts are made of acacia. Carrying out dendrochronological work on indigenous Egyptian wooden species is problematic because Kuniholm has examined more than 1000 samples of acacia for dendrochronological potential without success (Kuniholm et al. 2014:94). I also counted the rings of a cross-section from an acacia tree from Saqqara, collected in 1931 from a beam from the funerary complex of King Djoser, Third Dynasty-Old Kingdom (Figure 1.2). Each time I counted a different number of rings because ring boundaries are either invisible or partially invisible, and without identifying specific rings dendrochronology is not possible. Ten students were tasked with counting the rings on one of the sections Douglass collected in 1930s from an Egyptian pyramid; they generated 10 different counts (Kuniholm et al. 2014:95). Therefore, this study focuses on the LTRR samples of cedar or juniper, in addition to briefly shedding light on the ASM samples of indigenous wood.

Problem Statement

This thesis examines the LTRR wooden objects. Studying archaeological LTRR samples will help in determining the possibilities of conducting dendrochronological research on Egyptian wooden materials.

Thesis Outline

This thesis is presented in five chapters, including this introductory chapter. Chapter 2 presents briefly the past work of dendrochronology and Dendro-Egyptology. Chapter 3 describes the Laboratory of Tree-Ring Research (LTRR) Egyptian wooden collection and presents the
implications of this research. Chapter 4 sheds light on ancient wood trade routes and wood species and uses in ancient Egypt. Chapter 5 concludes with the results of this research and suggests future directions and additions to Dendro-Egyptology.
Chapter 2

Past Work of Dendrochronology and Dendro-Egyptology

In this chapter, I introduce briefly the past work of dendrochronology and Dendro-Egyptology, outlining the pioneers of dendrochronology and their efforts to establish a dendrochronological sequence for Egypt.

Past Work of Dendrochronology

Dendrochronology is the study of tree time (Nash 2002:243), and can be described as a multidisciplinary science that provides chronological, behavioral, and environmental data to an astonishing variety of fields of inquiry such as “architectural analysis, biology, climatology, economics, ecology, fire history, forestry, geology, history, hydrology, pollution studies, political science, resource economics, sociology, volcanology, and other disciplines” (Nash 2002:243; Spear 2010). Ferguson (Ferguson 1970:183) indicates that “Dendrochronology or tree-ring dating” can be defined as “the study of the chronological sequence of annual growth rings in trees”. The main task of this science is to create a calendar date for a wood or charcoal specimen (Stokes and Smiley 1996:xi). Because tree-rings offer essential information and insights into time and past events, dendrochronology can be utilized to date material culture, establish chronologies, and define sequences. In this sense, archaeologist Fay-Cooper Cole of the University of Chicago confirms that “Chronology is the soul of archaeology” (Nash 1998:261-262). By the mid-20th century, dendroarchaeology became very important among archaeologists as a tool in dating material culture (Baillie 1982; Bannister 1962:508; Bannister and Robinson 1992; Dean 1978, 1996; Haury 1935:98-99; Kuniholm 2001, 2002; Speer 2010; Towner
2002:68). Although several decades have passed since this science was established, dendrochronology is still a relatively new science. Stokes and Smiley (1996:xv) state that:

Dendrochronology, or tree-ring dating as it is often called, is defined as the study of the chronological sequence of annual growth rings in trees.

It is pointed out that “Dendrochronology has gained recognition among archaeologists as an accurate tool for chronological control” (Speer 2010:152). Haury (1935:98-99) referred to the importance of tree-rings in archaeology as a potential tool for archaeologists to use in dating. More than a half century later, Dean (1978) stressed the significance of using tree-rings in dating archaeological material. It is stated that tree-rings have been used “to verify the dating of historical works of art” and “to determine the origin of and trade routes for wood that has been incorporated into artifacts” (Speer 2010:152).

The principles of crossdating were discovered by Douglass in the last century when he recognized that accurate annual dating of tree rings could be achieved by matching patterns of narrow and wide rings across trees at a site (Maxwell et al. 2011:237). He could relate dendrochronological principles to history, climatology and astronomy. In 1914, Douglass began to date wood from various historical and archaeological sites. He had collecting pieces from different regions since 1911, when he recognized the importance of crossdating long before others in that field (Kuniholm 2001:3; Schweingruber 1988:257-258).

Finally, it is very important if interpreting the tree-ring dates to understand (1) past human behavior (past human behaviors as well as archeologist and dendrochronologist behaviors) (Dean 1996; Towner 2002:79), (2) the past environment (tree species affected by ancient people may refer to local species availability, and archaeological tree ring samples can be
used to reconstruct past precipitation and temperature regimes and also to identify past climatic severe events) and, (3), the interaction between past human behavior and environment (Towner 2002: 77).

**Past Work of Dendro-Egyptology**

In terms of applying dendrochronology to Egyptian material culture, some dendrochronologists have been interested in exploring the possibility of establishing a dendrochronology for ancient Egypt for decades. I here present what they have done and comment on some of their pioneering works in order to shed light on the new field of Dendro-Egyptology.

**A.E. Douglass (1867-1962): The Father of Dendrochronology**

A.E. Douglass is the Father of Dendrochronology. By the early 1920s, Douglass had pioneered the science of dendrochronology, most importantly, the principle of crossdating which he applied to a variety of different disciplines from climatology to astronomy to archaeology. He established the LTRR at the University of Arizona in 1937. During the developmental LTRR phase from 1930 to WWII, it has been pointed out that:

Douglass pursued a passion for replicating dendroarchaeological successes in other parts of the world, specifically the Near East. His personal correspondence before WWII explores this prospect. The idea of being able to establish tree-ring dates, especially for ancient Egyptian material was a very exciting, even romantic prospect. Douglass, while consulting with James Henry Breasted of the University of Chicago … and other prominent Egyptological institutions, developed a feasibility study of ancient Egyptian wooden sarcophagi. The initial study went well ... Yet, before the specimens could be properly analyzed and substantial progress towards a chronology achieved, WWII intervened, and this prospect remains unrealized (Creasman et al. 2012: 85).

Later, that passion for the Near East would inspire Bannister to conduct extensive dendrochronological work in that important region of the ancient world (Bannister 1970:1;
Bannister and Robinson 1975:213). In the 1920s, Douglass contacted several Egyptologists exploring the probability of establishing chronology for ancient Egypt based on dendrochronology. By 1932, Douglass, in consultation with numerous members of the Egyptological and museum communities, believed that enough amount of wooden material already existed in the museums of the world to make significant advance (Breasted 1933; Douglass 1932).

In the 1930s, Douglass conducted a small feasibility study to crossdate tree-ring specimens of Egyptian coffins in American museums (Touchan and Hughes 2009). This occurred in the LTRR development from year 1930 to WWII (Douglas 1929; Creasman et al. 2012:81-82). Douglass tried to employ a technician to establish a chronology for Egypt based on dendrochronology, but, the technician accepted another position to work in the Southwest (Douglass 1936; Nash 1999). In 1937, Douglass established the LTRR at the University of Arizona (UA) and became its first director until his retirement in 1958 (Creasman et al. 2012:82). As a result of this passion, in 1938, Douglass received ten specimens from the Eleventh Dynasty coffin of Ipi-Ha-Ishutef (OIM 12072) from J. Wilson, director of the Oriental Institute (OI) of the University of Chicago (Teeter 2011). Douglass conducted dendrochronological work on this coffin to crossdate the specimens, but the project stopped due to the outbreak of WWII.

E.W. Haury (1904-1992): The Southwest Archaeologist

E.W. Haury received his BA degree in 1927 and his MA degree in 1928. Then he started teaching at the Univeristy of Arizona Department of Archaeology in the academic year 1928-1929 (Reid 1993:245-246). The following year (1929) he worked with Douglass (Bannister and Robinson 1992; Reid and Whittlesey 2005). Haury had hoped to write a dissertation on the
application of tree-ring dating in Egypt (Thompson et al. 1997:158-159). In the 1930s, he gathered successfully wooden specimens from the ancient Egyptian collection at the Museum of Fine Arts in the city of Boston, stating that, “I believe it is not unlikely that tree-rings might well substantiate and possibly amplify” the chronological timetable of Egypt in the ancient phase of its long history (Haury 1935:108). However, he worked on a large collection from southern Arizona and earned his Ph.D. in anthropology on the classic period of the Hohokam culture in 1934. Thus, his research on Egyptian material was short-lived.

**B. Bannister (1926- ): The Student of Douglass**

B. Bannister was a student of Haury and research assistant for Douglass (Touchan and Hughes 2009). As a student of Douglass (Bannister et al. 1998), the same passion for the Near East inspired Bannister; therefore, he conducted extensive dendrochronological work for archaeological tree-ring dating in that region of the ancient world (Bannister 1970; Bannister and Robinson 1975; Touchan and Hughes 2009).

In the 1960s, Bannister visited Egypt and collected and examined tree-ring specimens from pyramids and coffins. For example, he examined specimens from the pyramids of the Fourth Dynasty king Sneferu (c. 2613-2589 BC) in Dahshur (Kuniholm: Personal Communication, February 2014), in order to set up a systematic tree-ring dating of ancient Egyptian archaeological sites (Bannister 1970:7; Touchan and Hughes 2009). He confirmed the viability of cedars (*Cedrus libani*) imported in antiquity for crossdating (Bannister 1970:7; Touchan and Hughes 2009). Bannister (1970:7) concludes:

> The establishment of absolute tree-ring dates for ancient Egypt might eventually be possible and the securing of core samples from living cedars of Lebanon would constitute a logical first step.
After analyzing those specimens that Bannister collected, Dean referred to the possibility of future successes in this area (Dean 1978). Then P.I. Kuniholm took over.

**P.I. Kuniholm (1937- ): The Head of the Middle Generation**

P.I. Kuniholm has developed Aegean and Eastern Mediterranean dendrochronological and dendroarchaeological sequences. In the 1970s, he was inspired by the work of Bannister at Gordion in Turkey and decided to conduct an extensive project by creating the basis for dendrochronology in the ancient Near East on a large scale. He began by building chronologies of living trees from several forests from southern Italy to eastern Turkey (Kuniholm and Striker 1987; Kuniholm 1990b, 1994; Touchan and Hughes 2009). Kuniholm started the Aegean dendrochronology project with his Ph.D. dissertation on this region of the ancient world. He also founded the Cornell Dendrochronology Laboratory (now the Malcolm and Carolyn Wiener Laboratory for Aegean and Near Eastern Dendrochronology) in 1976, creating the field of archaeological dendrochronology of the Mediterranean and Near East. He was encouraged by Bannister and Dean to establish dendrochronology for ancient Egypt, and as a result, he collected a significant set of ancient Egyptian wood specimens from American museums. In 1973, he showed interest in conducting dendroarchaeological work on ancient Egyptian material culture (Kuniholm: Personal Communication, February 2014) [Figure 2.1].
He worked on a Twelfth Dynasty Dahshur boat (Carnegie Museum of Natural History in Pittsburgh 1842-1) and a likely Eleventh Dynasty Saqqara coffin (OIM 12072), attempting to crossdate two floating cedar chronologies from these two sites and dynasties of ancient Egypt (Kuniholm 1990a, 1991, 1992, 2007), both recently radiocarbon dated and discussed by Manning et al. (2014). In the 1990s, Kuniholm studied the coffin of Ipi-Ha-Ishutef (OIM 12072) (Figure 2.2-2.3), and conducted dendrochronological work on it (1990a, 1991:3, 1992:459-460, 2007:369-370). In 1991, he states that:

I was able to crossdate the innermost rings of the Da[h]shur Boat (in the Carnegie Museum in Pittsburgh) with a sequence from the coffin of Ipi-ha-Ishutef, an army clerk of Dynasties IX/X (in the Oriental Institute of the University of Chicago). This is the first time that we have been able to achieve inter-site crossdating of cedar wood found in Egypt (but undoubtedly imported from Lebanon).
Figure 2.2: Part of the lid of Ipi’s coffin (left) and the Dahshur boat during reassembly (right below) in Pittsburgh and after reassembly (right above) (after Kuniholm et al. 2014:98; used by permission).

Kuniholm’s work suggested the coffin of Ipi a year date of 2076 BC (Kuniholm et al. 2014). A recently proposed radiocarbon range dated this coffin from 1883-2063 BC (Manning et al. 2014:405-406), very close to Kuniholm’s measurement date. Kuniholm’s work gave the Dahshur boat a year date of 1883 BC, while the Manning et al. (2014:406) is 2 years outside the proposed radiocarbon range from 1898-1885 BC. No terminal rings or waney edged are present on either the coffin or the boat, therefore these are terminus post quem dates (Kuniholm et al. 2014:99).
Conclusions

Dendrochronology has been very successful in the US Southwest. Although many attempts have been made by serious scholars on Egyptian wooden material, Dendro-Egyptology is still not flourishing as a solid discipline; much work needs to be done until it becomes an accepted and deeply rooted field. The situation in the US Southwest is very different from that of Egypt. In US Southwest, the local wood has been used to establish master chronologies; in Egypt local wood which the ancient Egyptians used to make their artifacts is inadequate for establishing a master chronology. There are no long-lived trees, and sampling existing structures—such as mosques and other historic buildings, is not feasible. One possible avenue of research for establishing a dendrochronological sequence for Egypt, however, is analysis of existing collections.
Chapter 3

Analysis of the LTRR Egyptian Wooden Collection

In this chapter, I present results of my analysis of Egyptian wooden material culture housed in both LTRR and ASM. The LTRR collection is mainly cedar/juniper and some local wood, while the ASM collection is comprised of indigenous wood.

The LTRR Collection

The LTRR collection consists of varied items of wooden material that have been collected from Egypt and are now housed in several American museums (Table 3.1). They are funerary items in nature and belong mainly to nonroyal elite members from different ancient Egyptian periods.

Table 3.1: Descriptions of wood elements at the LTRR.

<table>
<thead>
<tr>
<th>Species No.</th>
<th>Species</th>
<th>Form</th>
<th>Provenience</th>
<th>Date collected</th>
<th>Collected By</th>
<th>Number of Rings</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>EGY-1</td>
<td>Acacia?</td>
<td>X Sec. WD</td>
<td>Side wall, from Zoser’s tomb, Saqqara. Third Dynasty (ca. 3000-2800 B.C.)</td>
<td>1931</td>
<td>P. Duell</td>
<td>Hard to count the rings, some are visible and many are invisible.</td>
<td>Well sanded XSec. With inc. bark, cracks in the wood.</td>
</tr>
</tbody>
</table>

24
<table>
<thead>
<tr>
<th>EGY-3</th>
<th>Cedar</th>
<th>½” Core</th>
<th>Wide edge-board from top of coffin (from Oriental Institute Museum, Chicago)</th>
<th>1938</th>
<th>W. Boyes</th>
<th>117 rings</th>
</tr>
</thead>
<tbody>
<tr>
<td>EGY-4</td>
<td>Cedar</td>
<td>½” Core</td>
<td>Egyptian coffin, Narrow outer broad of top. (from Oriental Institute Museum, Chicago)</td>
<td>1938</td>
<td>W. Boyes</td>
<td>110 rings</td>
</tr>
<tr>
<td>EGY-5</td>
<td>Cedar</td>
<td>½” Core</td>
<td>Egyptian coffin. Wide edge-board from top of coffin (from Oriental Institute Museum, Chicago)</td>
<td>1938</td>
<td>W. Boyes</td>
<td>93 rings</td>
</tr>
<tr>
<td>EGY-6</td>
<td>Cedar</td>
<td>½” Core</td>
<td>Egyptian coffin. Left end top front broad. (from Oriental Institute Museum, Chicago)</td>
<td>1938</td>
<td>W. Boyes</td>
<td>72 rings</td>
</tr>
<tr>
<td>EGY-7</td>
<td>Cedar</td>
<td>½” Core</td>
<td>Egyptian coffin. Upper broad front, near eyes. (from Oriental Institute Museum, Chicago)</td>
<td>1938</td>
<td>W. Boyes</td>
<td>65 rings</td>
</tr>
<tr>
<td>EGY-8</td>
<td>Cedar</td>
<td>½” Core</td>
<td>Egyptian coffin. Top board back. (from Oriental Institute Museum, Chicago)</td>
<td>1938</td>
<td>W. Boyes</td>
<td>77 rings</td>
</tr>
<tr>
<td>--------</td>
<td>--------</td>
<td>----------</td>
<td>-------------------------------------------------------------------------------------------------</td>
<td>------</td>
<td>----------</td>
<td>---------</td>
</tr>
<tr>
<td>EGY-9</td>
<td>Cedar</td>
<td>½” Core</td>
<td>Egyptian coffin. Bottom board, back. (from Oriental Institute Museum, Chicago)</td>
<td>1938</td>
<td>W. Boyes</td>
<td>50 rings</td>
</tr>
<tr>
<td>EGY-10</td>
<td>Cedar</td>
<td>½” Core</td>
<td>Egyptian coffin. Lower board, right end. (from Oriental Institute Museum, Chicago)</td>
<td>1938</td>
<td>W. Boyes</td>
<td>10 a has 72 rings, 10b has 81 rings</td>
</tr>
<tr>
<td>EGY-11</td>
<td>Cedar</td>
<td>½” Core</td>
<td>Egyptian coffin. Top board, right end. (From Oriental Institute Museum, Chicago)</td>
<td>1938</td>
<td>W. Boyes</td>
<td>66 rings</td>
</tr>
<tr>
<td>EGY-12</td>
<td>Cedar</td>
<td>½” Core</td>
<td>Egyptian coffin. Top board, left end. (from Oriental Institute Museum, Chicago)</td>
<td>1938</td>
<td>W. Boyes</td>
<td>42 rings</td>
</tr>
<tr>
<td>EGY-13</td>
<td>Unk.</td>
<td>½” Core</td>
<td>From Museum of Fine Arts, Boston</td>
<td>1938</td>
<td>E. Schulman</td>
<td>Two pieces of a broken; not well sanded core.</td>
</tr>
<tr>
<td>EGY-14</td>
<td>Unk.</td>
<td>½” Core</td>
<td>From Museum of Fine Arts, Boston</td>
<td>1938</td>
<td>E. Schulman</td>
<td>Two pieces of a broken core; not sanded.</td>
</tr>
<tr>
<td>--------</td>
<td>------</td>
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<td>----------------------------------</td>
<td>------</td>
<td>-------------</td>
<td>------------------------------------------</td>
</tr>
<tr>
<td>EGY-15</td>
<td>Unk.</td>
<td>WD Block</td>
<td>From Museum of Fine Arts, Boston</td>
<td>1938</td>
<td>E. Schulman</td>
<td>66 rings Mostly complacent rings</td>
</tr>
<tr>
<td>(BOS-1)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Almost rectangular piece of wood. It has two holes in its side surface for dowels. One hole contains the dowel and it comes out from the other side. The other hole does not have the dowel.</td>
</tr>
<tr>
<td>EGY-16</td>
<td>Unk.</td>
<td>WD</td>
<td>From Museum of Fine Arts, Boston</td>
<td>1938</td>
<td>E. Schulman</td>
<td>6 pieces of EGY-16. The rings are complacent; not sanded; local wood? Hard to see.</td>
</tr>
<tr>
<td>(BOS-2)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EGY-17</td>
<td>Unk.</td>
<td>WD</td>
<td>From Museum of Fine Arts, Boston</td>
<td>1938</td>
<td>E. Schulman</td>
<td>The well sanded side has 50 rings</td>
</tr>
<tr>
<td>(BOS-3)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Undefined shape of 7 sides, The dowel still in.</td>
</tr>
<tr>
<td>EGY-18</td>
<td>Unk.</td>
<td>WD</td>
<td>From Museum of Fine Arts, Boston</td>
<td>1938</td>
<td>E. Schulman</td>
<td>Not found in the collection.</td>
</tr>
<tr>
<td>(BOS-4)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EGY-19</td>
<td>Unk.</td>
<td>WD</td>
<td>From Museum of Fine Arts, Boston</td>
<td>1938</td>
<td>E. Schulman</td>
<td>51 rings</td>
</tr>
<tr>
<td>(BOS-5)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Undefined shape of 7 sides, the side contains the rings almost rectangular. There is also another small square piece of EGY19 and it is not sanded.</td>
</tr>
<tr>
<td>EGY-20</td>
<td>Unk.</td>
<td>WD block</td>
<td>From Museum of Fine Arts, Boston</td>
<td>1938</td>
<td>E. Schulman</td>
<td>Not sanded so it is hard to see.</td>
</tr>
<tr>
<td>(BOS-6)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EGY-21</td>
<td>Unk.</td>
<td>WD</td>
<td>From Museum of Fine Arts, Boston</td>
<td>1938</td>
<td>E. Schulman</td>
<td>42 rings</td>
</tr>
<tr>
<td>(BOS-7)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>A six sided undefined shape</td>
</tr>
<tr>
<td>EGY-22  (BOS-8)</td>
<td>Unk.</td>
<td>WD</td>
<td>From Museum of Fine Arts, Boston</td>
<td>1938</td>
<td>E. Schulman</td>
<td>The well sanded side has 63 rings; mostly complacent. Almost a six sided shape; one side has two holes with their dowels. The wood has a hole in the middle and a crack.</td>
</tr>
<tr>
<td>------------------</td>
<td>------</td>
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<td>----------------------------------</td>
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<td>-------------</td>
<td>---------------------------------------------------------------</td>
</tr>
<tr>
<td>EGY-23  (BOS-9)</td>
<td>Unk.</td>
<td>WD</td>
<td>From Museum of Fine Arts, Boston</td>
<td>1938</td>
<td>E. Schulman</td>
<td>Two sides were sanded. The well sanded one has 111 rings. There is another rectangular piece of wood labeled EGY-23? With two sanded sides the well sanded side has 53 rings and it has four holes. Almost a square piece of wood, has two holes in the middle and another two holes one at each side.</td>
</tr>
<tr>
<td>EGY-24  (BOS-10)</td>
<td>Unk.</td>
<td>WD</td>
<td>From Museum of Fine Arts, Boston</td>
<td>1938</td>
<td>E. Schulman</td>
<td>It has two sanded sides, the well sanded one has 52 rings. A rectangular piece of wood with three holes in its surface.</td>
</tr>
<tr>
<td>EGY-25  (BOS-11)</td>
<td>Unk.</td>
<td>WD</td>
<td>From Museum of Fine Arts, Boston</td>
<td>1938</td>
<td>E. Schulman</td>
<td>47 rings A square piece of wood has one well sanded side.</td>
</tr>
<tr>
<td>EGY-26</td>
<td>Unk.</td>
<td>WD</td>
<td>From Museum of Fine Arts, Boston</td>
<td>1938</td>
<td>E. Schulman</td>
<td>It has two sanded sides. The well sanded side has 128 rings.</td>
</tr>
<tr>
<td>---------</td>
<td>------</td>
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<td>---------------------------------</td>
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<td>-------------</td>
<td>------------------------------------------------------------</td>
</tr>
<tr>
<td>EGY-27</td>
<td>Unk.</td>
<td>WD</td>
<td>From Museum of Fine Arts, Boston</td>
<td>1938</td>
<td>E. Schulman</td>
<td>Almost rectangular piece of wood, not sanded</td>
</tr>
<tr>
<td>EGY-28</td>
<td>Unk.</td>
<td>WD</td>
<td>From Museum of Fine Arts, Boston</td>
<td>1938</td>
<td>E. Schulman</td>
<td>A square piece of wood from a coffin? It has a small hole at the not sanded side.</td>
</tr>
<tr>
<td>EGY-29</td>
<td>Unk.</td>
<td>WD</td>
<td>From Museum of Fine Arts, Boston</td>
<td>1938</td>
<td>E. Schulman</td>
<td>The well sanded side has 110 rings.</td>
</tr>
<tr>
<td>EGY-30 a?</td>
<td>Unk.</td>
<td>WD</td>
<td>From Museum of Fine Arts, Boston</td>
<td>1938</td>
<td>E. Schulman</td>
<td>The well sanded side has 28 rings.</td>
</tr>
<tr>
<td>EGY-30 b?</td>
<td>Unk.</td>
<td>WD</td>
<td>From Museum of Fine Arts, Boston</td>
<td>1938</td>
<td>E. Schulman</td>
<td>The well sanded side has 31 rings.</td>
</tr>
<tr>
<td>EGY-30</td>
<td>Unk.</td>
<td>WD</td>
<td>From Museum of Fine Arts, Boston</td>
<td>1938</td>
<td>E. Schulman</td>
<td>100 rings</td>
</tr>
<tr>
<td>--------</td>
<td>------</td>
<td>----</td>
<td>---------------------------------</td>
<td>------</td>
<td>-------------</td>
<td>-----------</td>
</tr>
<tr>
<td>EGY-31</td>
<td>Unk.</td>
<td>WD block</td>
<td>From Museum of Fine Arts, Boston</td>
<td>1938</td>
<td>E. Schulman</td>
<td>100 rings</td>
</tr>
<tr>
<td>EGY-32</td>
<td>Unk.</td>
<td>WD block</td>
<td>From Museum of Fine Arts, Boston</td>
<td>1938</td>
<td>E. Schulman</td>
<td>100 rings</td>
</tr>
<tr>
<td>EGY-33</td>
<td>Cedar</td>
<td>½” Core</td>
<td>From Museum of Fine Arts, Boston</td>
<td>1938</td>
<td>E. Schulman</td>
<td>95 rings</td>
</tr>
<tr>
<td>EGY-34</td>
<td>Cedar</td>
<td>½” Core</td>
<td>From Museum of Fine Arts, Boston</td>
<td>1938</td>
<td>E. Schulman</td>
<td>92 rings</td>
</tr>
<tr>
<td>EGY-35</td>
<td>Cedar</td>
<td>½” Core</td>
<td>From Museum of Fine Arts, Boston</td>
<td>1938</td>
<td>E. Schulman</td>
<td>115 rings</td>
</tr>
<tr>
<td>EGY-36</td>
<td>Cedar</td>
<td>½” Core</td>
<td>From Museum of Fine Arts, Boston</td>
<td>1938</td>
<td>E. Schulman</td>
<td>163 rings</td>
</tr>
<tr>
<td>EGY-37</td>
<td>Cedar</td>
<td>½” Core</td>
<td>From Museum of Fine Arts, Boston</td>
<td>1938</td>
<td>E. Schulman</td>
<td>78 rings</td>
</tr>
<tr>
<td>EGY-38</td>
<td>Cedar</td>
<td>½” Core</td>
<td>From Museum of Fine Arts, Boston</td>
<td>1938</td>
<td>E. Schulman</td>
<td>85 rings</td>
</tr>
<tr>
<td>EGY-39</td>
<td>Cedar</td>
<td>½” Core</td>
<td>From Museum of Fine Arts, Boston</td>
<td>1938</td>
<td>E. Schulman</td>
<td>196 rings</td>
</tr>
<tr>
<td>EGY-40</td>
<td>Cedar</td>
<td>½” Core</td>
<td>From Museum of Fine Arts, Boston</td>
<td>1938</td>
<td>E. Schulman</td>
<td>206 rings</td>
</tr>
<tr>
<td>EGY-41 (BOS-28)</td>
<td>Cedar</td>
<td>½” Core</td>
<td>From Museum of Fine Arts, Boston</td>
<td>1938</td>
<td>E. Schulman</td>
<td>90 rings</td>
</tr>
<tr>
<td>------------------</td>
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</tr>
<tr>
<td>EGY-42 (BOS-29)</td>
<td>Cider</td>
<td>½” Core</td>
<td>From Museum of Fine Arts, Boston</td>
<td>1938</td>
<td>E. Schulman</td>
<td>116 rings</td>
</tr>
<tr>
<td>EGY-43 (BOS-30)</td>
<td>Cider</td>
<td>½” Core</td>
<td>From Museum of Fine Arts, Boston</td>
<td>1938</td>
<td>E. Schulman</td>
<td>Broken into 10 small fragments Doubtful 16 repairable note on envelope “same end of 21.965 as BOS 28 (EGY-41) but coming in from coffin edge as BOS 29 (EGY-42).”</td>
</tr>
<tr>
<td>EGY-44</td>
<td>Cedar</td>
<td>WD CNIPS (2)</td>
<td>From Museum of Fine Arts, Boston</td>
<td>1938</td>
<td>E. Schulman</td>
<td>Two fragments. Note on envelope:” to CNIPS from neighboring plank, in process of getting start on boring for BOS-28(EGY-41).” See drawing on core EGY-41</td>
</tr>
<tr>
<td>Code</td>
<td>Species</td>
<td>Type</td>
<td>Origin</td>
<td>Year</td>
<td>Collector</td>
<td>Rings</td>
</tr>
<tr>
<td>--------</td>
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<td>----------</td>
<td>-----------------</td>
<td>------</td>
<td>-----------</td>
<td>-------</td>
</tr>
<tr>
<td>EGY-46 (DD-1)</td>
<td>Unk. Wood block</td>
<td>From Museum of Fine Arts, Boston</td>
<td>1942</td>
<td>D. Dunham</td>
<td>35</td>
<td>Note on envelope: “Egyptian coffin wood given by Dunham, Boston Museum May 1, 1942.” Almost a small square piece of wood</td>
</tr>
<tr>
<td>EGY-47</td>
<td>Unk. WD</td>
<td>Egypt</td>
<td>?</td>
<td>Wilson &amp; Burtch</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NA-1</td>
<td>Ficus sycomorus L.</td>
<td>XS</td>
<td>Egypt, Cairo, Matariya tree</td>
<td>1965</td>
<td>B. Bannister</td>
<td></td>
</tr>
<tr>
<td>NA-2</td>
<td>Ficus sycomorus L.</td>
<td>Core</td>
<td>Egypt, Cairo, Matariya tree</td>
<td>1965</td>
<td>B. Bannister</td>
<td></td>
</tr>
<tr>
<td>NA-3</td>
<td>Acacia?</td>
<td>½″</td>
<td>Egypt, Meidum Pyramid</td>
<td>1965</td>
<td>B. Bannister</td>
<td></td>
</tr>
<tr>
<td>NA-4</td>
<td>Juniper</td>
<td>½″</td>
<td>Egypt, Meidum Pyramid-shaft leading to main chamber.</td>
<td>1965</td>
<td>B. Bannister</td>
<td></td>
</tr>
<tr>
<td>NA-5</td>
<td>Juniper</td>
<td>½″</td>
<td>Egypt, Meidum Pyramid-shaft leading to main chamber.</td>
<td>1965</td>
<td>B. Bannister</td>
<td></td>
</tr>
<tr>
<td>NA-6</td>
<td>Juniper</td>
<td>½″</td>
<td>Egypt, Meidum Pyramid-shaft leading to</td>
<td>1965</td>
<td>B. Bannister</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Juniper ½” Core</td>
<td>Egypt, Dahshur, S. Pyramid</td>
<td>1965</td>
<td>B. Bannister</td>
<td>Notes</td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>----------------</td>
<td>---------------------------</td>
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<td>--------------</td>
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<td></td>
</tr>
<tr>
<td>NA-7</td>
<td>Juniper ½” Core</td>
<td>Egypt, Dahshur, S. Pyramid</td>
<td>1965</td>
<td>B. Bannister</td>
<td>A note on an empty envelope said NA-7</td>
<td></td>
</tr>
<tr>
<td>NA-8</td>
<td>Juniper ½” Core</td>
<td>Egypt, Dahshur, S. Pyramid</td>
<td>1965</td>
<td>B. Bannister</td>
<td>Probably lost in 3/82 fire. A note on an empty envelope said NA-8, 9, 10</td>
<td></td>
</tr>
<tr>
<td>NA-9</td>
<td>Juniper ½” Core</td>
<td>Egypt, Dahshur, S. Pyramid</td>
<td>1965</td>
<td>B. Bannister</td>
<td>Missing, lost while on loan to Cornell, stated by P. P. Creasman</td>
<td></td>
</tr>
<tr>
<td>NA-10</td>
<td>Juniper ½” Core</td>
<td>Egypt, Dahshur, S. Pyramid</td>
<td>1965</td>
<td>B. Bannister</td>
<td>Probably lost in 3/82 fire</td>
<td></td>
</tr>
<tr>
<td>NA-11</td>
<td>Juniper ½” Core</td>
<td>Egypt, Dahshur, S. Pyramid</td>
<td>1965</td>
<td>B. Bannister</td>
<td>Missing, lost while on loan to Cornell, stated by P. P. Creasman</td>
<td></td>
</tr>
<tr>
<td>NA-12</td>
<td>Juniper ½” Core</td>
<td>Egypt, Dahshur, S. Pyramid</td>
<td>1965/6?</td>
<td>B. Bannister</td>
<td>Missing, lost while on loan to Cornell, stated by P. P. Creasman</td>
<td></td>
</tr>
<tr>
<td>NA-13</td>
<td>Juniper ½” Core</td>
<td>Egypt, Dahshur, S. Pyramid</td>
<td>1965</td>
<td>B. Bannister</td>
<td>Missing, lost while on loan to Cornell, stated by P. P. Creasman</td>
<td></td>
</tr>
<tr>
<td>NA-14</td>
<td>Juniper ½” Core</td>
<td>Egypt, Dahshur, S. Pyramid</td>
<td>1965</td>
<td>B. Bannister</td>
<td>Missing, lost while on loan to Cornell, stated by P. P. Creasman</td>
<td></td>
</tr>
<tr>
<td>NA-15</td>
<td>Juniper ½” Core</td>
<td>Egypt, Dahshur, S. Pyramid</td>
<td>1965</td>
<td>B. Bannister</td>
<td>175 rings</td>
<td></td>
</tr>
<tr>
<td>NA-16</td>
<td>Juniper us sp. ½” Core</td>
<td>Egypt, Dahshur, S. Pyramid</td>
<td>1965</td>
<td>B. Bannister</td>
<td>Missing, lost while on loan to Cornell, stated by P. P. Creasman</td>
<td></td>
</tr>
<tr>
<td>NA-17</td>
<td>Juniper ½” Core</td>
<td>Egypt, Dahshur, S. Pyramid</td>
<td>1965</td>
<td>B. Bannister</td>
<td>Missing, lost while on loan to Cornell, stated by P. P. Creasman</td>
<td></td>
</tr>
</tbody>
</table>
Kuniholm and Newton worked on building chronologies constructed from Egyptian materials collected by Douglass, Bannister, and others (Kuniholm: Personal Communication)

[Table 3.2].

<table>
<thead>
<tr>
<th>NA-18</th>
<th>Unk.</th>
<th>3 frags, small</th>
<th>Egypt, Saqqara, Southern Tomb near the Step Pyramid of Zoser.</th>
<th>1965</th>
<th>B. Bannister</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Floater, from S. Pyramid, collected for C-14</td>
</tr>
</tbody>
</table>

Table 3.2: Chronologies made by Kuniholm and Newton (Kuniholm: Personal Communication)

<table>
<thead>
<tr>
<th>Source</th>
<th>Current Location</th>
<th>Species</th>
</tr>
</thead>
<tbody>
<tr>
<td>Senwosret III’s Boat</td>
<td>Carnegie Museum,</td>
<td>Cedar</td>
</tr>
<tr>
<td>Djehutynakht’s Tomb, Tomb 10 A</td>
<td>MFA, Boston</td>
<td>Cedar</td>
</tr>
<tr>
<td>Ipihaishutef’s Coffin</td>
<td>Oriental Institute,</td>
<td>Cedar</td>
</tr>
<tr>
<td>Sneferu’s Bent Pyramid</td>
<td>LTRR</td>
<td>Juniper</td>
</tr>
<tr>
<td>Sneferu’s Meidum Pyramid</td>
<td>LTRR</td>
<td>Juniper</td>
</tr>
<tr>
<td>Source</td>
<td>Current Location</td>
<td>Species</td>
</tr>
<tr>
<td>Dahshur</td>
<td>Carnegie Museum,</td>
<td>Cedar</td>
</tr>
<tr>
<td>Dayr al-Barsha, Middle Egypt</td>
<td>MFA, Boston</td>
<td>Cedar</td>
</tr>
<tr>
<td>Provenance unknown, probably Saqqara</td>
<td>Oriental Institute,</td>
<td>Cedar</td>
</tr>
<tr>
<td>Dahshur</td>
<td>Carnegie Museum,</td>
<td>Cedar</td>
</tr>
</tbody>
</table>

Species: Cedar, Cedar, Cedar, Juniper, Juniper
<table>
<thead>
<tr>
<th>Approximate Dating</th>
<th>Dynasty 12, Senwosret III</th>
<th>Dynasty 11</th>
<th>Dynasties 9-10 (2213-2035 BC), according to the chronology of K. Baer</th>
<th>Dynasty 4</th>
<th>Dynasties 3 and 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Notes</td>
<td>A 322 year long integrated cedar chronology from 8 trees. The samples from this group included an additional sample of deck planking that is 410 years long, but does not fit with the other samples. Cuttings on its under-side suggest that it is reused.</td>
<td>A 222 year long cedar chronology from sequences from the lid to Djehutynakht (male) inner coffin, the lid to Djehutynakht (female) outer coffin and some of the cedar planks/blocks from object # 155-638 (this object has not yet been positively identified as coming from Tomb 10 A).</td>
<td>Two cedar chronologies for this coffin have been established (CHI 345 is 145 years long and comes from planks from the coffin lid, CHI 444 is 83 years long and comes from planks of the coffin body). The two sequences do not crossdate with one another.</td>
<td>Two juniper chronologies have been established from logs from the upper chamber. One chronology developed from 4 different trees is 263 years long, the other chronology was developed from 3 trees and is 193 years long. Difficulties in crossdating may be due to the erratic nature of the samples near the ends.</td>
<td>A 137 year juniper sequence from one tree.</td>
</tr>
</tbody>
</table>

As shown above, the specimens from the coffin of the local governor, Djehutynakht and his wife (from Tomb 10A at Dayr el-Bershah, now at the Boston Museum of Fine Arts) include (EGY 33 to EGY 46), but only 11 cores show any dendrochronological potential. Kuniholm and Newton have analyzed these cores and crossdated three planks. If radiocarbon assays confirm the dendrochronological results —with multiple pieces and at least 222 years of overlap, possibly
more—they would be able to report the dendrochronological dates next year (Kuniholm 2014 et. al.:100). Cores numbers EGY 33, 34, 37, 38 crossdated and may be from the same tree.

Out of 47 cores titled by EGY only 35 cores are useful for conducting dendrochronology and only one core out of 19 cores titled by NA is good for dendro work as follow: EGY 35, 36, 39, 40, 41, and 42 are crossdated and also may be from the same tree. EGY 21 and EGY 22 match. EGY 30a, b, c match EGY 24, 25, 26, 29. EGY 30a, b, c and EGY 29 are from the same coffin and tree. EGY 23 a, b match EGY 22, 15, 2. EGY 23a, b through EGY30a, b, c are from the same coffin and tree. EGY 19, 21, and 15 NA match. Below I present the coffin of Ipi-Ha-Ishutef (OIM 12072) as an applied case study for conducting Dendro-Egyptology on ancient Egyptian wooden material culture.

**The Coffin of Ipi-Ha-Ishutef (OIM 12072): A Case Study**

After examining the LTRR specimens, I identified ten samples as imported wood; probably cedar/juniper. Because it is a little bit hard to identify cedar and juniper under the microscope, I cannot distinguish between them. These samples are ideal for doing a dendrochronological work in the Levant. Therefore, I have examined them under the microscope and generated skeleton plots to check the ring definition and sensitivity, and to determine the number of rings.

I examined ten samples (EGY 3 to EGY 12) as a model for Dendro-Egyptology. These specimens came from a coffin that was excavated around the pyramid complex of king Teti (Dynasty Six, Old Kingdom) at Saqqara of the Memphite Necropolis (PM III\(^2\): 393-574; Firth and Gunn 1926: 61-65; Málek 1984: 409; Chauvet 2001).
The dendro-Egyptological study and analysis of wooden specimens taken from the coffin of the scribe and overseer of the expedition [or army], Ipi-Ha-Ishutef, (OIM 12072), passed through several attempts without reaching or achieving its final goals. This coffin of Ipi-Ha-Ishutef (PM III²: 570) had been inscribed and decorated with textual and pictorial representations designed to assist the coffin owner in his afterlife. The interior of the lid contains funerary and magical spells used by non-royal elite members and known as Coffin Texts (Lesko 2001; Lichtheim 2006: 131 f.). The remainder of the coffin’s interior bears depictions of items that the Ipi-Ha-Ishutef had used on earth and would need in the hereafter. The date of this coffin is the First Intermediate Period [specifically dynasties: 9-10]; however, Teeter (2011: 127, Fig. 51) attributes it to Dynasty 11 without providing any supporting evidence. As a result of that chaotic period, the Levantine timber which the ancient Egyptians had imported since ancient times stopped due to economic and security concerns. Therefore, the ancient Egyptians were forced to reuse the old timber they had found accessible in constructing their new wooden material culture (Lichtheim 2006: 83 ff.; Creasman 2013).

Methodology

The ten cores from this coffin were mailed in a wooden envelope from the Oriental Institute (OI) of the University of Chicago to Andrew Ellicott Douglass at LTRR in 1938.
### Table 3.3: Specimen identification and descriptions

<table>
<thead>
<tr>
<th>OI Number</th>
<th>LTRR Number</th>
<th>Core Location on Coffin</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>EGY-3</td>
<td>Lid – Right Side – Top</td>
</tr>
<tr>
<td>2</td>
<td>EGY-4</td>
<td>Lid – Right Side – Lower</td>
</tr>
<tr>
<td>3</td>
<td>EGY-5</td>
<td>Lid – Right Side – Middle</td>
</tr>
<tr>
<td>4</td>
<td>EGY-6</td>
<td>Front Board – Top – Left End</td>
</tr>
<tr>
<td>5</td>
<td>EGY-7</td>
<td>Front Board – Top – Right – Above the Eyes</td>
</tr>
<tr>
<td>6</td>
<td>EGY-8</td>
<td>Back Board – Top – Middle</td>
</tr>
<tr>
<td>7</td>
<td>EGY-9</td>
<td>Back Board – Lower – Left</td>
</tr>
<tr>
<td>8 A</td>
<td>EGY-10 A</td>
<td>Side Board – Right - Lower – Down</td>
</tr>
<tr>
<td>8 B</td>
<td>EGY-10 B</td>
<td>Side Board – Right - Lower – Up</td>
</tr>
<tr>
<td>9</td>
<td>EGY-11</td>
<td>Side Board – Right – Top – Middle</td>
</tr>
<tr>
<td>10</td>
<td>EGY-12</td>
<td>Side Board – Left – Top</td>
</tr>
</tbody>
</table>

Core Number 8 has two pieces, 8A and 8B; however, I only use the OI numbers throughout the study. Table 3.3 shows that the selected cores were taken from different spots on the coffin as requested by Douglass (Figures 3.1, 3.2, 3.3, 3.4). I skeleton plotted for each core. The ten counts on the cores refer to previous dendrochronological attempts on the coffin. The cores are well surfaced except for Core 1. I first introduce the photographs of the coffin and the locations of cores, then the scans of the cores and the skeleton plots done on them.
Figure 3.1: Location of cores 1, 2, and 3 on coffin OIM 12072 (courtesy of LTRR).
Figure 3.2: Location of cores 4, 5, 6, 9, and 10 on coffin OIM 12072 (courtesy of LTRR).
Figure 3.3: Location of cores 6 and 7 on coffin OIM 12072 (courtesy of LTRR).
Results

The crossdating of the cores shows that some cores match with each other; as Cores 1, 2, and 3 show good cross match (Figures 3.5, 3.6), therefore, may be they were cut from the same tree; cores 4 and 9 also cross match (Figures 3.8). Cores 5 and 6 show some matching and were probably cut from the same tree (Figures 3.9). False Ring number 44 was not counted according to the traces of previous counting points on Core 8A. By adding False Ring 44 to this core, I have found that Cores 8A and 8B match and were probably cut from the same log (Figures 3.12).

Figure 3.4: Location of cores 8 A, 8 B, and 9 on coffin OIM 12072 (courtesy of LTRR).
Figure 3.5: Core 1.

Figure 3.6: Cores 2, 3 and the skeleton plots for cores 1, 2, 3.

Figure 3.7: Core 4.
Figure 3.8: core 4 and 9.

Figure 3.9: cores 5, 6.
Figure 3.10: Core 7.

Figure 3.11: Skelton plot for core 7.

Figure 3.12: cores 8A and 8B.
Discussion

Without having a master chronology for Dendro-Egyptology, the date of this coffin can be fixed by crossdating two floating chronologies as Kuniholm has done with this coffin and the Twelfth Dynasty Dahshur boat (Kuniholm 1990a, 1991, 1992, 2007, Kuniholm et al. 2014) which provided a good estimate (also compare recently Manning et al. 2014). Therefore, we still depend on the date which Egyptologists had assigned to this coffin according to their traditional Egyptological tools and common Egyptian chronology and we cannot reject that date. Egyptologically, the coffin is also unpublished and still under study by a scholar from the Oriental Institute. Cores, especially Core 4 (Figure: 3.7), show complacent rings and that was a challenge for crossdating.

Some cores match and probably come from the same tree, others match and are from different trees, and some do not match at all like cores 7, 10 (Figures: 3.10, 3.11, 3.13, and
Kuniholm and Newton suspected at the time a missing-ring problem, but could not prove it with the available material (Kuniholm et al. 2014:99). I worked on Ipi later on 2013 and could define that missing ring. This coffin was probably reused from a previous wooden object. Although many cases of wood reuse in ancient Egypt have been documented (Creasman 2013), it is difficult to confirm that happened with this coffin.

**The ASM Samples Collection**

The ASM Samples Collection is mainly Egyptian indigenous wood. These samples are some wooden figures and items that were donated to the museum over a long time. As can be seen, these samples are precious artifacts at the ASM, therefore it will be hard to take them from the museum to the LTRR for examination. Probably in the future scanning them could be the solution to detriment the possibility of conducting dendrochronological research on them.

**Conclusions**

In order to conduct dendrochronology on these materials, several specimens needed to be date and match them with others from the same period, as Kuniholm did when he matched coffin of Ipi-Ha-Ishutef and the Pittsburgh boat, by dating them on the basis of comparing their ring patterns with wooden material culture from Anatolia. As the case study of the coffin of Ipi-Ha-Ishutef (OIM 12072) shows that work has been previously started by Douglass in 1930s and Kuniholm in 1990s, and followed by Manning et al. (2014) and Kuniholm et al. (2014), the present state of applying dendrochronology to Egyptian material culture still needs more work. There is a real and urgent need for establishing a master chronology for this new scientific field:
dendro-Egyptology. The ASM samples show that it is hard to conduct dendrochronological studies on them because they are indigenous Egyptian wood (Cichocki 2006:366).
Chapter 4

Wood Trade Routes and Wood Types and Uses in Ancient Egypt

It is known in Egyptological literature that indigenous Egyptian wood species are of poor quality; good quality timber always had to be imported from the Near East (Baines and Malék 2000:20). Connections between Egypt and Byblos in Lebanon are documented since the Old Kingdom. Byblos played an important role as a port, and from the time of the unification of Egypt it was employed by the ancient Egyptians as a major source of wood (Shaw 2000:320). Although several wooden objects have been found from Predynastic Egypt, good woodworking became only probable with the use of copper as metal tools by early Dynastic Egypt (Jones 1995:72). The famous cedar of Lebanon is found in Egypt as early as the Second Dynasty (c. 2890-2686 B.C.) [Shaw: 2000:320]. Sneferu (c. 2575-2551 B.C.) of the Fourth Dynasty records the arrival of a convoy of forty ships laden with mrw wood from Lebanon. The first funerary boat of Khufu, the builder of the Great Pyramid at Giza, was made of Lebanese cedar. Furthermore, a type of wooden statue (naked youth) is characteristic of the end of the Old Kingdom (Baines and Malék 2000:129). So strong was the connection between the country of origin of timber and the process of boat building dependent on it, that the Egyptian named their sea-going ships “Byblos-ships”, a term which was still in use in the Late Period to describe Nakau’s newly introduced Greek triremes. Even in the Coffin Texts, the deceased is said to punt with a pole made from the “cedar” of Byblos, and during his Asiatic campaigns, Tuthmose III (c. 1479-1424 B.C.) built cargo vessels of the same wood, obtained from the same locality (Jones 1995:72-73). Old Kingdom Byblos ships were probably like those of King Sahure. These seem to have come back to Egypt from someplace in the Levant. Even if Byblos boats were clearly attached to Syria-Palestine in the Old Kingdom, then the word became generic, occurring only
once in the New Kingdom, and in the Ptolemaic Period it was employed to identify the warships of the Greeks. And even in late Old Kingdom Egypt, Byblos ships were utilized to trade with the remote land of Punt (Vinson 1994:23). Wood was occasionally used for the manufacture of stelae, especially from the Third Intermediate Period onwards (Baines and Malék 2000:62).

As early as Dynasty One, coniferous wood (almost Cedrus libani) was being traded from the Levant to the Nile Valley. Throughout ancient Egyptian history the trade was resumed, as a result Byblos had become among the most important trading ports on the Levantine coast (Oakley 1932:159). By the late Predynastic Period trade goods from the Levant are found all over Egypt, and by Dynasty One large beams of imported wood were utilized in buildings (Vinson 1994:20). In his tomb self-presentation, Weni, who lived in the Sixth Dynasty, tells us that the Pharaoh Merenra (c. 2255-2246 B.C.) sent him to bring a false door, lintels, and portals for a royal pyramid complex in six barges and three two-boats of eight ribs. Sometime later, the same king commissioned him to build a “broad-boat” of 60 cubits (31.5 m) in length and cubits (15.75 m) in breadth of local acacia to transport an offering-table from the alabaster quarry at Hatnub in Middle Egypt (Breasted 1988, I.§323; Jones 1995:65).

**Imported Wood**

Egypt imported wood from Lebanon and other places (Davies 1989:146-156). Wood of enough size and quality was always rare in ancient Egypt (Jones 1995:72). Fine woods such as cedar, juniper, and ebony were imported from western Asia and tropical Africa (Shaw 2000:320). Moreover, Nubia, to the south, was a region through which African goods reached the country and an important source of hard wood (Baines and Malék 2000:178).
Cedar

Cedar (*Cedrus libani*) is called *mrw* in ancient Egyptian (*Wb*. I: 228[1-5]; Nibbi 2003:69-83). Cedar is described as being pinkish-brown, straight-grained, aromatic, very durable, and takes a good polish (Gale et al. 2000:349-350). It resists rot and insects and has a distinctive scent. Cedar is a large tree varying between 30-40 meters in height. Items made of cedar have been found from as early as the Predynastic Period until the Ptolemaic Period (Gale et al. 2000:349-350). It is mainly used for making coffins, shrines, boats, and furniture (Lucas & Harris 1989:432; Gale et al. 2000:349; Kuniholm et al. 2014). The Tutankhamun collection also contains a beautiful cedar throne (Eaton-Krauss 2008:57-67 [no. 2]). The Metropolitan Museum of Art houses a distinctive panel of Thutmose IV’s throne which was made of cedar (Dorman 1987:53-54, fig. 35). The trade of cedar stretches back to the reign of Khasekhemwy (Second Dynasty), but the Fourth Dynasty Palermo Stone (reign of King Sneferu) suggests much heavier trading, “bringing forty ships full of cedar/pine wood to Egypt” (Strudwick 2005:65-66 esp. 66; Breasted 1988:146; Ward 2000:20-22; Leospo 1987:121). There are several references to cedar in Egyptian records under different rulers of the New Kingdom and later (such as Hatshepsut, Thutmose III, and others) [O’Connor 2006:1-38 esp. 18]. The tomb of Sennefri (TT 99) depicts his trip to and from Byblos in Lebanon on the mission of acquiring cedar wood for the Amun temple at Karnak (Bryan 2006:81; Laskowski 2006:190). An inscription accompanies the workshop scene in the Rekhmire’s tomb (TT 100), “Making furniture out of ivory, ebony, *sesnedjem*-wood, *meru* wood, and real cedar from the top of the terrace (i.e. Lebanon) [Hodel-Hoenes 2000:155]. These are just a few from the multitude of examples of cedar use. It is traditionally believed among scholars that Egyptians traded for “conifer timber from the Levant” among which are Lebanese cedar, juniper, cypress, fir, pine and others (Davies 1995:146-156;
Thirgood 1981:87). Meiggs (1982) and other scholars (Lucas 1989:432-434; Killen 1980), agree with Lucas when he claims, “it became common to call any cedar wood found in Egypt as Cedrus libani”. This is the point of contention for Nibbi (1994), who argues in several articles against this opinion and considers it an assumption that should be changed. According to Nibbi, “cedar of Lebanon cannot be distinguished anatomically through the microscope from other cedar. It is scientifically impossible to label ancient cedar wood as Cedrus libani, because this can only be an assumption and not a conclusion based on any evidence” (Nibbi 1994:35-52 esp. 35; and see also, Nibbi 1996:37-59; Nibbi 1987:13-27; Nibbi 1985:17-26). She lists several reasons for not accepting the conclusion that all types of cedar used in Egypt were from Lebanon (such as the existence of Cedrus brevifolia in Lebanon among other trees) [Nibbi 1994:37]. She also disagrees with many of Meiggs’s opinions, for instance, his considering ʕš the Egyptian word for cedar. Loret (1916) rejects the use of ʕš to designate cedar, suggesting that fir or pine, or even the generic term for both, would be a more accurate translation. Loret’s main point is that when ʕš, “was labeled in the ancient Egyptian iconography, it was shown to be pale gold and never a reddish-brown, as was the case with cedar” (Loret 1916:33-51). Nibbi (1996) adds that mrw is mentioned in the Merikare text as an example of wood which is said to come from the west. She goes through the examples that Loret used as his arguments and one of them is the sarcophagi of Sopi in which three headrests are depicted. The caption of the first reads ʕš and the object is pale yellow in color; the third is reddish and mrw is written. None of the varieties of cedar are pale and yellow (Nibbi 1996:43, fig.1). Davies (1995:152) Prefers the use of ʕš to designate cedar, “though it might also on occasion have had a generic usage”. Some scholars don’t agree with Nibbi’s methods of ignoring the texts and subsequent conclusions; they believe that the lack of specific characteristic of Egyptian wood designations leaves much room for
lexicographical disapproval and that Egyptians were not always specific with their terminology regarding wood (e.g., El Gabry 2014).

Botanists define four species of cedar today, but it is not possible to differentiate between the wood each produces. *C. deodara* grows in the Himalayas, *C. brevifolia* in Cyprus, *C. atlantica* in the Atlas Mountains of the Maghreb, and *C. libani* in forests at elevations to 1000 meters above sea level in Lebanon, on the coastal mountains of Syria, and in southern Turkey (Mikesell 1969:1-28; White 1983:155). Although the Egyptians may have exploited Libyan and more western resources, texts point to the Levantine coast as the source of cedar and other large conifers (Green 1983:38-59).

**Juniper**

Juniper from the Levant, *Juniperus excels*, *J. communis* are known as "Š? or *mrw*? These species of juniper grow with cedar in the mountains of the Eastern Mediterranean and reach 20-25 meters in height. Currently, ten percent juniper is mixed with cedar in a cedar forest growing at an elevation between 1700 and 2000 meters above sea level in southern Turkey (Kuniholm: Personal Communication). Juniper’s red fragrant wood provided resin and oil used as incense; it was often confused with cedar, although junipers were almost never of comparable height or girth (Meiggs 1982:410-416). A piece of wood from the Khufu I hull has been identified as juniper (Nour 1960:45), as has wood from ancient Egyptian musical instruments in the Louvre (Nibbi 1981:23). Dendrochronological testing by the Malcolm and Carolyn Wiener Laboratory for Aegean and Near Eastern Dendrochronology identified juniper logs in the ¾ Meidum pyramid and the Dynasty Four pyramid at Dahshur (Letter to P. I. Kuniholm from M. Newton on 30 June 1989 mentioned in Ward: 2000). Nibbi (1981) argues that Š? is juniper, citing the scarcity of identified cedar samples before Dynasty Nine or Ten, but juniper is less frequently
reported than cedar for the same period. Recent work amply documents abundant cedar remains (Nibbi 1981; Davies 1995:150) and shows that more than half the identified juniper objects date to the Graeco-Roman Period.

**Cypress**

*Cypress (Cupressus sempervirnes)* is a reddish-brown, even-grained, smooth, aromatic, and durable wood that takes a good polish (Gale et al. 2000:350; Hepper 1990:46). It exists in Syria, Lebanon, Turkey, and Crete among other areas. It was used in the manufacture of furniture, boats, statuary, carving, monumental doors and construction (Gale et al. 2000:350). The Metropolitan Museum of Art contains several pieces of furniture that are entirely or partially made of cypress, e.g. Hatnofer’s chair (Lucas and Harris 1989:434). Cypress grows to 30 meters in coastal mountains from Maghreb to Jordan (White 1983:153; Rowton 1967:261-273). Cypress has been identified in the Dynasty Three plywood coffin of Saqqara, Middle Kingdom dovetail tenons, and in Dynasty Eighteen jewelry and toilet boxes, becoming more common in the Late Period (Arnold 1992:97-99; Davies 1995:150-151; Lucas and Harris 1989:434). Other types of imported wood may be used occasionally, but because we have no textual evidence, we cannot prove it.

**Indigenous Wood Species**

Scientists tend to describe the areas adjoining Egypt in ancient times as deserts devoid of all vegetation, similar to today. But, according to the Egyptian reliefs and paintings, scientists need to modify the old point of view (Nibbi 1981:1; Thirgood 1981:87). There was a moister climate in North Africa reaching its peak around 10,000 B.C. (Quézel 1963). Sinai still carries evidence of the Mediterranean phase of vegetation in small lush valleys where scientists reported...
seeing a number of juniper trees in the hilly areas of northern Sinai, namely Gabel El-Maghara, in Yelleg and Halal (Range 1921; Boulos 1960; El Banna et. al 2010). Lucas and Harris (1989:312) recorded a report from year 1943 that about 100 junipers had been seen in these areas, indicating survivals of a former forest. In confirmation of this, there is an evidence for juniper in northern Sinai from Neolithic Period (Phillips and Par-Yosef 1974:483 f.). There is Juniperus phoenicea in Sinai called w$n in ancient Egyptian language. This is the only native (?) Egyptian conifer. It grows to 10 meters in the mountains of northern Sinai today (Boulos 1960:129; Ward 2000:17) and probably represents the remnants of a once abundant woodland dating to the Neolithic period (Phillips and Bar-Yosef 1974:483-491; Ward 2000:17).

**Sycamore Fig**

Sycamore fig (Ficus sycomorus) was called nht in ancient Egyptian (Hannig 2006:442; WB II: 282 [7-13]). It grows in the Nile Valley, Sinai and Oases of the Western Desert and was used as timber in all kinds of woodwork because of its resistance to decay, and because it was light and easy to carve (Gale et al. 2000:345; Germer 1985:124-125; Killen 1980:6; Lucas and Harris 1989:447-448; Deglin 2012:86). Sycamore is characterized by its hardness (Śliwa 1975:11), pale, light, fibrous and coarse texture, and poor quality for construction (Gale et al. 2000:340). Its many knots (Svart 1998:127) and prevalence throughout Egypt have led to identification of many pieces of this tree in ancient contexts (Killen 1980:1, 6). The sycamore tree has small and sweet fruit (figs) and the leaves and milky fluid were used as medicine (Germer 2001:537). The tree’s girth can reach 8 meters and its height 20 meters. Permission from the king’s palace was required before cutting sycamore trees. Sycamore figs were associated with Hathor, Neith, Nut, and other goddesses, usually with the goddess of the tree. Mentioned in funerary and religious texts throughout Egyptian history that huge trunks and many
small branches, sycamore trees dominate the subterranean world and appear in the Pyramid and Coffin Texts (Baum 1988:18-87).

Nile Acacia

The Nile Acacia (*Acacia nilotica*) was called Šnūt/Šnū in ancient Egyptian (Hannig 2006:831). Acacia has been used in Egypt since the Predynastic Period (Lucas and Harris 1989:442) and evidence of its use can be traced throughout Egyptian history (Killen 1994b:7). Several varieties of this genus are native to Egypt and it is the most used of the indigenous trees (Svarth 1998:127). It is described as red, hard, and durable (Gale et al. 2000:335-336), although the limited dimension of the timber makes it inconvenient for use in large objects (Cooney 2007:206). It was a good source for building ships because it is tough and durable (Leospo 1987-1989:120). Using this wood in shipbuilding was mentioned in the Sixth Dynasty self-presentation of Weni from Abydos (Strudwick 2005:356). According to Svarth, it was used broadly in furniture making, dowels, bows and arrows (Svarth 1998:172). Hepper (1990:23) details, “Acacia bark provided an important source of tannin for the preparation of leather from hides, and a blue dye for linen cloth was extracted from acacia pods”.

Texts document an Old Kingdom expedition to Middle and Upper Egypt that built acacia boats 60 and 100 cubits (32-52 m) long (Lichtheim 2006:21-23). Modern records of traditional watercraft from Upper Egypt and the Sudan suggest that it remained a primary wood source for the region (Hornell 1942:1-36). Dockyard records of the early Middle Kingdom refer to the delivery of boatloads of “white” acacia timber (Simpson 1965:2). Its hardness was valued for manufacturing tenons. The Khufu vessel, the Lisht timber, and the shrines of Tutankhamun include acacia tenons. Coffins from the Old, Middle and New Kingdoms had both tenons and pegs of acacia. Furniture of all periods, the Predynastic Period logs and roots, the Early Dynastic
Period beams, and tree trunks of acacia are also known (Lucas and Harris 1989:40; Davies 1995:146-156). Acacia was also valued for tool-making. Large mallets made of wood taken from the root-trunk junction used the natural strength of the gnarly wood, and axe hafts the Predynastic to the Coptic period are identified as acacia (Podzorski et al. 1985:122-124; Gale 1987:128).

**Tamarisk**

Tamarisk (*Tamarix nilotica* and *Tamarix aphylla*) is called *jsr* in ancient Egyptian (*Wb.* I: 130; Hannig 2006:116-117; Gale et al. 2000:345). This wood has been described as coarse and dense (Gale et al. 2000:345). Tamarisk, also called salt ceder (Hepper 1990:48), is a desert shrub with thin branches and leaves. It was less highly regarded because it provide only pieces of limited size. It also can warp during the seasoning process, further limiting the scope of its uses to small objects of daily life (Leospo 1987:120). Tamarisk has many defects, such as knots, as well as being difficult to work (Killen 1980:6). Objects made of tamarisk have been found from as early as the Neolithic Period until the Graeco-Roman Period. This species grows everywhere in Egypt and it is the only one to become a full tree and not stay as a shrub (Deglin 2012:86).

**Carob**

Carob (*Ceratonia Siliqua*) is called *nfm* in ancient Egyptian. Carob is a small evergreen that produces hard, strong, and good quality wood (Gale et al. 2000:338). It is widely found in the Mediterranean region, but in Egypt, it grows only in gardens (Baum 1988:162-168). The carob is a small evergreen tree with a thick and knotty trunk up to 10 meters high. Carpenters appreciate its reddish, dense wood. The carob prefers non-irrigated, semi-arid to arid conditions; its roots can extend quite deep in order to reach subterranean water.
During the New Kingdom, ancient Egyptian pharaohs acquired some carob wood furniture and logs from Syria, based on the Annals of King Thutmose III, which record that he received tributes from the Levantine cities in his first campaign (Breasted 1988:436; Killen 1980:2; Meggis 1982:60, 65). Booty of carob was also taken from Syria in his second campaign (Breasted 1988:447, 512).

Carob, a dominant eastern Mediterranean plant, is recorded by Gabel Haggege on the western desert coast of Egypt in connection with Juniperus phoenicea and Olea europaea (Ward 2000:16). It is noted that scattered carob trees grew along the northwest Egyptian coast (Lucas & Harris 1989:443). Local conditions argue against the development of shrubby, Mediterranean vegetation, and the uniqueness of the population may more reasonably indicate introduced plants (Ward 2000:16).

The word nDm appears in the First Intermediate Period at Dendera, in a list of orchard plants from Dynasty Eighteen, and in recipes for perfumes and unguents from Late Period laboratories at Edfu and Dendera. New Kingdom pharaohs obtained carob-wood furniture and logs from Syria (Breasted 1988:436,512). The same word, but with a different determinative, is used to describe a product of Punt, but it is thought that this was an acacia (Ward 2000:16).

**Dom Palm**

Dom Palm (Hyphaene thebaica) is called m3m in ancient Egyptian (Hannig 2006:338). The Dom palm is principally a fruit tree, like the date palm, but it is too dense and hard, which is why Egyptian craftsmen used it in manufacturing boats and beams (Gale 2000:347; Ward 2000:17; Killen 1980:3; Lucas & Harris 1989:444; Baum 1988:106-120). It grows in Upper-Egypt. The leaves are used in cordage and mats; its fibers are used for making brushes. It has
been used probably in furniture, but it was used as the webbing for some chairs and stools (Greiss 1957:41-48,112,114,127).

Like the date palm, ancient woodworkers used its hard trunk for beams and boat or raft construction (Cumming 1984:139; Lucas 1962:444; Täckholm 1974:763). The ancient Egyptians associated the Dom palm with Nubia and Punt, and it was sacred to the temple of Hathor at Dendera. The Dom palm’s primary distribution is in Upper Egypt from Abydos southward and in the western oases (Ward 2000:17).

A Second or Third Dynasty tomb at Saqqara used Dom palm wood for roofing, but the tree is mentioned in texts only after the Old Kingdom. The Eighteenth Dynasty black granite statue of the Butler and Foreman of works, Minmosi from Medamud, proclaims, “I taxed the chieftains of the land of Nubia… many ships of Dom palm wood as yearly taxes …” Minmosi was super intendant of works under Amenhotep II at the Turah quarries (Cumming 1984:139).

Date Palm

Date palm (*Phoenix dactylifera*) is called *bnrt* in ancient Egyptian (Greiss 1957:41-48,112,114,147-148; Hannig 2006:271). The date palm has been characterized as soft, fibrous and poor construction quality (Gale et al. 2000:347-348). It is well represented in Egypt (Delta and Nile valley) and often depicted on tomb scenes. The wood was usually used for buildings (roof timber). Its stringy texture makes it inconvenient for executing joint work, but appropriate for mats and baskets (Ward 2000:16-17; Lucas 1989:443-444).

The date palm’s cylindrical trunk reaches 20 meters or more. Salt and heat tolerant, the date palm lives in the Delta and the Nile Valley, the Egyptian oases, humid parts of the desert, and along the Red Sea coasts. A food source from at least the Paleolithic in Egypt, the date palm...
appears on palettes and in a list of offerings from Dynasty One. Its leaves, fibers, and poor quality wood were utilized to make mats, baskets, and roofs. Date-palm wood has also been identified in two wood samples from coffins (Březinová et al. 1976:139-142). Archaeologists have commonly attributed ancient cordage samples to the date palm, but a recent analysis suggests that modern Egyptians use and rely on it more than people of Pharaonic times (Ryan and Hansen 1987).

Plum

The use of this wood to make furniture is otherwise unknown (Eaton-Krauss 1995:85-89; Baum 1988:266; Gale et al. 2000:343). Furthermore, there is a stool from the Seventeenth-Eighteenth Dynasty as being made of Christ’s thorn (nbs), known as sidder (ziziphus spine Christi) (Gale et al. 2000:347; Cooney 2007:207; Baum 1988:169-176; Lucas and Harris 1989:446). To sum up, these local species usually produced poor quality wood with short lengths and small cross sections which limited the kinds of constructions.

Wood Uses

Wood was used in ancient Egypt for different purposes such as making boats, statues, coffins, furniture, and funerary boxes (Table 4.1). Sycamore was one of the most important trees in ancient Egypt and was used in funerary equipment, for making furniture, statues (Figure:4.1), boats (for more about boat building and woodworking techniques (see Jones 1995:72-83); about boats from the Predynastic Period through the Graeco-Roman Period (see Vinson 1994:7-52), coffins, stelae, and minor tools, boxes, dovetail tenons, models, and vases from the Old Kingdom until the Roman Period (Brezinova and Hudra 1976:141; Davies 1995:146-156; Simpson 1965:34; Leospo 1987-1989:120). When the Eighteenth Dynasty queen Hatshepsut was building
barges for transporting her obelisks, a call for cutting sycamore fig trees was issued across the
country in order that sufficient wood could be acquired (Janssen 1975:371). A transverse section
cut from a wooden model of a building-cradle (used in raising blocks of stone) found in a
“Foundation Deposit” under the Temple of Queen Hatshepsut at Deir el-Bahari, and dating from
about 1500 B.C. the wood is that of sycamore (Oakley 1932:158). Late New Kingdom prices
suggest that the standard value of a sycamore fig log, of unspecified size but probably almost
small, was one-fifth of an axe (Janssen 1975:371). Sycamore is mentioned in Egyptian texts from
the Eighteenth Dynasty and it was often depicted on the tomb walls of the same period (Gale et
al. 2000:340). Although this wood was extensively used in Egypt when only small lengths were
required, it has serious limitations, and its coarse grain and light spongy texture make it
unsuitable for long straight beams. The hulls of many Nile boats in ancient Egypt were made of
this wood, cut into short rectangular blocks and built “brickwise” (Oakley 1932:158).

Davies (1995) conducted an analysis of thirty-six wooden coffins from the Department of
Egyptian Antiquities at the British Museum; the important goal of this project was to confirm the
identity of these woods and at the same time to determine the nature and extent of their use. The
thirty-six coffins date from the Old Kingdom (the Sixth Dynasty) to the late Second Intermediate
Period/ early Eighteenth Dynasty. Of the thirty-six coffins analyzed, twenty-four are made of
native wood-twenty of sycamore fig, three of tamarisk, one of sidder, and twelve of imported
wood, mainly cedar (Davies 1995:146,148).

Of the two hundred and thirty-one statues in the corpus of the Old Kingdom from
different museums, only fourteen have had their wood identified by scientific means, a further
three have been identified visually. Three others have identifications, but no confirmation that
this is the result of a scientific analysis. This is not enough to make any satisfactory conclusions
about the types of wood preferred. Fifteen of the statues are made of woods indigenous to the Nile valley (fourteen confirmed analyses), the remaining five are imported woods (Harvey 2001:617).

Five statues are made of sycamore:

1- The statue of Chief Lector Priest, Kaaper, late Dynasty IV, found by Mariette in Saqqara Tomb 36 (C 8), recent analyses states that it is made of sycamore wood (Saleh and Sourouzian 1987:40; Lokma 2005).
Figure: 4.1 Statue of Ka-aper, called “Sheikh el Baled”, sycamore wood, Old Kingdom, Egyptian Museum in Cairo (after Saleh and Sourouzian 1987:40; used by permission)
2- A statue of a striding male at Hildesheim museum is made of *Ficus sycomorus L.* (Harvey 2001:88).

3- A head and torso of a striding male at Hildesheim museum is made of *Ficus sycomorus L.* (Harvey 2001:91).

4- A statue of a striding male at Louvre (E 10357) has *Ficus* as its wood type (Harvey 2001:96, 617).

5- A head of a statue from tomb D2 at Meir (Blackman 1914) is *Ficus*; the tomb belongs to Pepiankh Heryib and dates to the later part of the reign of Pepy II (Baer 1960:133), Ashmolean Museum (Harvey 2001:617).

   Tamarisk was mainly used in the production of coffins, bows, tamaris rafts, dowels, pegs, and furniture such as chairs, beds, boxes, and lids (Lucas 1985:447; Gale et al. 2000:345; Śliwa 1975:11).

   Esteemed by carpenters because of its red color and heaviness, Egyptian texts contain several references to the use of carob for manufacturing fine furniture (such as footstools, tables and chairs), as well as bows and toiletry tools (Ward 2000:16).

   Although there is no direct evidence of its use in boatbuilding, use of carob wood in New Kingdom furniture (Breasted 1988:436, 512) suggests that its qualities may also have been appreciated in the superstructure of furnishings of finer watercraft. Toilet articles and mummy labels also have been identified as carob (Davies 1995:150).

   The Egyptian plum, *Balanites aegyptiaca* L. Delile (Germer 1985:98-99) was used for boat building. Palms were used for furniture and for roofing timber, most often in the oases, such as the dom palm, *Phoenix dactylifera* L. (Gale et al. 2000: 347; Germer, 1985:232-233; Lucas and Harris 1989:443-444).
The sidder, called *nbs (ziziphus spina-christi*) (L.) Desf. (Gale et al. 2000:347; Germer, 1985:114-115; Killen 1980:6; Lucas & Harris 1962:446), was used as timber for joinery and for small items (Deglin 2012:86).

*Acacia nilotica* is a hard wood, excellent for fuel and charcoal but it was mainly used for timber in boat building, for tools (Deglin 2012:86) and false doors (Figure: 4.2).
Figure: 4.2 False door of Ika, Acacia wood, Old Kingdom, Egyptian Museum in Cairo (after Saleh and Sourouzian 1987:58; used by permission)
It seems that ancient Egyptians advanced techniques in joinery or laminating in order to lessen the impact of low grade and fibrous timber in an attempt to create a large sheet of material which was dimensionally stable and equally strong in all directions, such as the plywood used in a coffin in the Step Pyramid of the Third Dynasty King Djoser at Saqqara (Gale et al. 2000:356-357, fig. 15.19; Killen 1980:9).

The publication of Maadi excavations (Rizkana and Seeher 1989) described about ninety-five samples, eleven of them cedar. The samples included some carbonized timber. The majority tamarisk and acacia; eight samples were unrecognizable under the microscope (Kroll 1989:134-136).

The samples were divided into building wood and firewood, but some samples did not fit in either category; they were small pieces of red-brown pencil-sized wood, and some were found inside pottery vessels, not in the ground (Kroll 1989:134). Nibbi did not agree that the cedar found in Maddi was imported from Lebanon, because cedar was imported to obtain long straight timbers (Nibbi 1981:2; Nibbi 1987:135; Nibbi 1990:26). She states that the pattern of growth of the cedar of the Lebanon does not give any possibility of obtaining straight timber from its trunk, because one of its characteristics is the heavy side branching from a low level and this differentiates it from the Atlas and other cedar (Nibbi 1981:15; Nibbi 1987:13-17; Nibbi 1990:26).

Boats were often made of acacia or sycamore because these are among the most famous indigenous Egyptian woods and they were well-known boat-building material in subsequent periods. Pine and cypress were shipped from the Levant for royal or divine boats from the beginning of ancient Egyptian history (Vinson 1994:15).
Due to the close relationships between ancient Egypt and the Levant throughout ancient Egyptian history from the Fourth millennium B.C. onwards, the connections between these two cultures were significant. In those ancient periods, there were two ways of trading between Egypt and the Levant, by land and by sea. There were two land trade routes. southern route, ran from the east of Egypt through the Wadi Tumilat and across the Sinai peninsula to Beersheba in southern Palestine, from where it proceeded north along the central mountain route, passing by Hebron, near Jerusalem, and points north (Hoffmeier and Moshier 2013:485). The second route, the one that passes by the Mediterranean coast in north Sinai, ending at Gaza in southern Canaan (Hoffmeier and Moshier 2013:486).

Many scholars think that the “Ways of Horus” (wꜣwt ḫr) was the actual name of a route that connected Egypt and Asia (Gardiner 1920; Oren 1987; 2006; Bietak 1996:fig. 1; Hoffmeier 2005, 2006). It had a double function military and trade (Bergoffen 1991; Gardiner 1920; Oren 1987, 2006).
Table 4.1: Uses of wood in ancient Egypt.

<table>
<thead>
<tr>
<th>Wooden Remains/Period</th>
<th>Predynastic Period</th>
<th>Archaic Period (First and Second Dynasties)</th>
<th>Old Kingdom</th>
<th>Middle Kingdom</th>
<th>New Kingdom</th>
<th>Third Intermediate Period</th>
<th>Late Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>Structural Timber</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Coffins</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Statues</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Furniture</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Ships and Boats</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minor Objects</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>


**Conclusions**

The ancient Egyptians used wood for many uses beginning in the Predynastic Period. They imported wood from the Near East and also used local wood species of poor quality in their woodworking. Many terms had been given by them to the different types of wood that they used. The richness of wood sources in ancient Egypt indicates that dendrochronological research on ancient Egyptian wooden material culture and may be possible.
Chapter 5

Conclusions and Future Directions

Dendro-Egyptology is still a new field and needs such much effort to stand on its own. Bannister (1963) said that in order for dendrochronology to be carried out three conditions must be first be met: (1) The ancient inhabitants of a region must have used wood in quantity in their construction; (2) The wood must be cross-datable; and (3) enough of it must be preserved for proper study. All three conditions can be met—in certain circumstances—in Egypt. If dendrochronological research is to succeed in Egypt, it is most probably must be with cedar and juniper, both long-lived trees that grow next to each other in the mountains of Lebanon, the Taurus Mountains of Turkey’s southern coast, and in Cyprus (Kuniholm et al. 2007). Perfect samples for dendrochronological research would be of species that have been demonstrated (1) to produce annual growth rings, (2) respond to a range of climatic variables, and (3) retain more than 100 rings in order to produce viable cross matches (Fritts 1976; Cowie, 2013; Bradley 2015). In a perfect scenario, they would have some bark or outermost rings preserved and ideally come from contexts where reuse would be unlikely (Mitsutani 2004; Okochi et al. 2007).

The very limited dendrochronological work conducted on Egyptian wood, primarily by Kuniholm, demonstrates the possible limitations for this ideal scenario. Cedar (or juniper) wood is likely to have the greatest potential for building long chronologies from ancient funerary materials in Egypt, but as cedar trees are very long-lived (sometimes up to 500 or 600 years) (Cichocki 2006) and were used to produce multiple planks, it is possible that planks from the same tree may all appear to have different ages (depending from where in the tree they were cut) and may not overlap in time sufficiently to build a single chronology. It is also, as in many archaeological contexts, typically the practice to remove the bark and sapwood, utilizing only the
more durable heartwood. Without preservation of the last ring under the bark, it will not be possible to give a felling date for the trees used to make the artifact and by implication, the date of manufacture. Even where such evidence is preserved, there is also the common practice of reuse (Ward 2000). Timber used in tomb construction however might be realistically expected to include some sapwood as occurs in other old world contexts (Kuniholm 1980) and in such a scenario a relatively accurate “date after which” —“terminus post quem” could be provided; indeed, in the best scenario of bark being present, there would be a possibility to estimate the exact tree-ring year for construction. Enough of such long-lived trees brought together could allow us to construct very long sequences extending back through many generations and produce a continuous chronology against which new samples could be matched.

Kuniholm’s work has also shown the potential to crossdate modern cedar trees from Lebanon with those in Turkey and the Eastern Mediterranean. Therefore, if the first Egyptian tree-ring chronologies are floating, i.e., cannot initially be linked up with trees growing in the present, there are at least several long tree-ring chronologies from Anatolia that may present possibilities for dating new materials. For example, the 1598-year long juniper chronology extending through the Late Bronze Age into the Iron Age (Kuniholm 1993; Kuniholm et al. 1996; Manning et al. 2001) could overlap Egyptian samples.
Conclusions

Dendrochronology has been very successful in the US Southwest. Although many attempts have been made by serious scholars to date Egyptian wooden material, Dendro-Egyptology is still not flourishing as a solid discipline. Much work needs to be done until it becomes an accepted and deeply rooted field. The situation in the US Southwest is very different than that of Egypt. In US Southwest, the local wood has been used to establish master chronologies; in Egypt indigenous wood which the ancient Egyptians used to make their artifacts is inadequate for establishing a master chronology. There are no long-lived trees, and sampling existing structures—such as mosques and other historic buildings, is not feasible. One possible avenue of research for establishing a dendrochronological sequence for Egypt, however, is analysis of existing collections.

In order to conduct dendrochronology on these materials, several specimens are needed to date these and match them with others from the same period. Kuniholm did just this when he matched coffin of Ipi-Ha-Ishutef and the Pittsburgh boat, by dating them on the basis of comparing their ring patterns with wood from Anatolia (Kuniholm et al. 2014). The case study of the coffin of Ipi-Ha-Ishutef (OIM 12072) shows that work started by Douglass in 1930s and Kuniholm in 1990s, and followed by Manning et al. (2014) and Kuniholm et al. (2014), of applying dendrochronology to Egyptian material culture still needs more work. There is a real and urgent need for establishing a master chronology for this new scientific filed of Dendro-Egyptology. The ASM samples show that it is hard to conduct dendrochronological studies on them because they are local Egyptian wood species that lack the necessary attributes for crossdating.
The ancient Egyptians had used wood since their Predynastic Period. They imported wood from the Near East and also used local wood species of poor quality in their woodworking. Many terms were given by them to the different types of wood that they used. The richness of wood existence in ancient Egypt can encourage developing dendrochronological research on ancient Egyptian wooden material culture.

**Future of Dendro-Egyptology: Problems and Solutions**

Dendro-Egyptology in Egypt is promising and the country is virgin soil for conducting this science on its material culture. Although radiocarbon dating is useful and Egypt is among the few African countries that have radiocarbon laboratories, it is not as accurate as the tree-rings which are also used to improve the precision of radiocarbon dating (Taylor 2013; Jansen-Winkeln 2006; Ambers 2002; Manning et al. 2014). I believe that we should extend tree-ring sequences with older dead wood and then overlap tree-ring patterns with material from buildings constructed over the last two thousand years. The next stage would be to use wood from successively older buildings and other structures—although they are relatively few in number—to fill around 1300 years. Therefore, I plan to carry out dendrochronology on Egyptian wooden artifacts at American and European as well as Egyptian Museums (Bassir 2013). For example, the gilded wooden shrines of the Golden Pharaoh, Tutankhamun (Figure 5.1), can also be studied through dendrochronology as well as the statue of Kaaper or the Sheikh el Beled statue and the Third Intermediate and Late Periods coffins (Saleh and Sourouzian 1987). I will also work on Egyptian wooden artifacts such as shrines, chairs, stools, beds, statues, boats, and coffins (Figure 5.2) [El Gabry 2014].
Figure 5.1: The third gilded wooden shrine of the Golden Pharaoh Tutankhamun, Dynasty 18, New Kingdom, Egyptian Museum in Cairo (Courtesy of the Supreme Council of Antiquities; used by permission).
Figure 5.2: A wooden statue of the Golden Pharaoh Tutankhamun, Dynasty 18, New Kingdom, Egyptian Museum in Cairo (Courtesy of the Supreme Council of Antiquities; used by permission).
Future research on the remaining timbers in the Bent Pyramid of King Sneferu at Dahshur (Fakhry 1954; 1959; Maragioglio, Rinaldi, and Howell 1963; Verner 1998; Jánosi 2004; Kuniholm et al. 2007; Lehner 1997) which Bannister and Iskander did not core may contribute to Dendro-Egyptology. Bannister’s core holes are still there to show where he did work, I will core the remaining timbers (see Meiggs 1982; Arnold 1991, Figure 5.24 (and Figure 5.25) for an image [captioned there as cedar] of the juniper timbers in the western burial crypt of the Bent Pyramid at Dahshur). Dendrochronological work also should be done on some wooden elements of the Step Pyramid complex of King Djoser (or Zoser) at Saqqara (Lehner 1997; Verner 1998; Firth and Quibell 2007). There are also some very good Eleventh and Twelfth Dynasty cedar boards with a lot of rings from Dayr al-Barsha in the University of Pennsylvania Museum in Philadelphia which also contains a cedar chest excavated by Sir Flinders Petrie with notes in his handwriting on it (Kuniholm: Personal Communication of July 25, 2014; Silverman 1997). There are also cedar boards discovered in a cave at Mersa/Wadi Gawasis on the Red Sea (Kuniholm: Personal Communication of July 25, 2014; Ward and Zazzaro 2010; Ward 2012).

Coptic and Islamic wooden architectural and decorative elements, such as mihrabs, minbars, columns, Quran holders, and icons from archaeological sites at the Museum of Islamic Art and the Coptic Museum in Cairo, are also good examples for future dendrochronological work. I will apply to the Permanent Committees of Egyptian and Islamic and Coptic Antiquities and the museums’ boards of the Supreme Council of Antiquities, Ministry of Antiquities and Heritage, Cairo, Egypt, to get their permission to scan and photograph these wooden artifacts without harming them. I plan to scan and photograph these Egyptian wooden artifacts with a high resolution camera (Mitsutani 2004; Okochi et al. 2007). This technique has a high potential for success, although it is easier to work with the wood itself than with a photograph. Modern
technologies make things easier. Recently the British Museum held an exhibition called *Ancient Lives. New Discoveries* where it displayed eight mummies from its collection. They all were CT-scanned and visualization of what is inside the bandages was presented along with the mummies (Taylor 2004; Taylor and Antoine 2014; Fletcher et al. 2014). Thus dendrochronology in Egypt can be carried out in a sensitive way without any damage due to these samples and fully considering issues relating to reuse and chronology, and collecting the maximum information. I plan to establish a dendro-databank and these collected data should be stored in a centralized database for the whole country so that every precious piece sampled will be counted towards my broader goal: establishing an absolute master chronology for Egypt. Since much of the wood preserved in any Egyptian context is likely to be from artifacts, there is a real need to establish a protocol for collecting as much archaeological meta-data to accompany the dendrochronological measurements (Brewer et al. 2010).

Some obstacles on the road may slow down this process of the new discipline of dendro-Egyptology however, the major problem that faces the introduction of dendrochronology to Egypt is the unfamiliarity of this new science in the country. Therefore, it is important to found a new department at the faculty of sciences at Cairo University in cooperation with its faculty of archaeology. This academic program in this new department should be interdisciplinary combining Egyptian material culture, sciences, and statistics. Translating and publishing articles and fundamental books in dendrochronology into Arabic (Schweingruber 1988, for example) is the first step that should be taken in order to introduce the science of dendrochronology to Egyptian authorities, scholars, Egyptologists, scientists, professionals, and students. We should also provide training and hold workshops for Egyptian archaeologists and scientists to make them learn the principles of dendrochronology and how to take samples for dendro-analysis.
Because no coring can be carried out on Egyptian wooden material, therefore scanning or photographing Egyptian wooden material would be the best way to carry out dendrochronological work in Egypt without harming its material culture (Mitsutani 2004; Okochi et al. 2007). Because Egyptian law prevents transferring artifacts abroad, there is a real need to found a laboratory of tree-ring research in Egypt and attach it to the mother laboratory of tree-ring research at the University of Arizona.

Future Research

The future of Dendro-Egyptology has many hopes as well as challenges. As a newly-born science within dendrochronology, or dendroarchaeology, and dendroclimatolgy, this field faces the problem of not yet having a master chronology for Egypt. Dendro-Egyptology still needs a cooperative and productive team work of Egyptologists, Near Eastern archaeologists, archaeologists, conservators, scientists, mathematicians, and dendrochronologists (dendroarchaeologists and dendroclimatologists). Dendro-Egyptology should apply several and different methodologies and techniques to advance it into the right and suitable direction. I plan to make a tree-ring chronology for Egypt as part of the new generation in Egypt who will make this happen; however, I acknowledge that it will need much time, money, and effort.

Therefore, I plan to study Egyptian artifacts from the beginning of Islamic Egypt in 642 AD (Petry 1998) and move to the end of the family of Mohamed Ali Basha in 1952 AD (Bassir 2012; Daly 1998; Fahmy 2002, 2009). This study will be a great addition not only to the history of Islamic Egypt but also to the history of the Near East during the period since the whole region was usually under one monarchy. Therefore, this chronology can be used for Egypt and the neighboring areas especially the Levant, Iraq, and North Africa. Because Egypt was under the Ottoman Empire for almost four centuries (Petry 1998), and with a long record of importation of
wood from the Ottomans into Egypt (Mikhail 2011), the chronology which Kuniholm (1980; Kuniholm et al. 1996) built for the Aegean can be crossdated with the Egyptian and the Near Eastern chronologies. I also plan to work on older materials from archaeological sites. Jewish Synagogues, monasteries, and Coptic churches, Islamic mosques in Egypt, such as Saint Catherine’s Monastery at Mount Sinai (Rossi and De Luca 2006), the Hanging Church (Enss 2005), the Ben Ezra Synagogue (Roth 2003), and the mosque of Amr Ibn al-As in Al-Fustat or Old Cairo (Behrens-Abouseif 1989), are good possibilities for Dendro-Egyptology. Also, early in the year of 2015, a team from LTRR composed of P.P. Creasman, W. Wright, and C. Baisan went to Egypt to collect samples from indigenous trees to investigate the possibility of conducting dendrochronological work on them.

To sum up, the road to establish dendrochronological sequences for Egypt is so long and still at the beginning. Many scholars since Douglass did their best to found what I call Dendro-Egyptology, but the future of this new field is still open and needs so much effort, time, and money. I think this field will be improved significantly by broadening its scope and by training many young Egyptian scholars and making them strongly engaged in this field. The future of this science is promising and full of many challenges as well as hopes.
# APPENDIX: CHRONOLOGY OF EGYPTIAN HISTORY

## CHRONOLOGICAL TABLE OF EGYPTIAN HISTORY (after Baines 2013 and Bassir 2012)

<table>
<thead>
<tr>
<th>Period</th>
<th>Dates</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Predynastic</strong></td>
<td>ca. 5000-3000 BC</td>
</tr>
<tr>
<td>Naqada I</td>
<td>ca. 3800-3500 BC</td>
</tr>
<tr>
<td>Naqada II</td>
<td>ca. 3500-3300 BC</td>
</tr>
<tr>
<td>Naqada III (Late Predynastic and Dynasty 0)</td>
<td>ca. 3300-3000 BC</td>
</tr>
<tr>
<td><strong>Early Dynastic Period</strong></td>
<td></td>
</tr>
<tr>
<td>1&lt;sup&gt;st&lt;/sup&gt;-3&lt;sup&gt;rd&lt;/sup&gt; Dynasties</td>
<td>ca. 3000-2575 BC</td>
</tr>
<tr>
<td><strong>Old Kingdom</strong></td>
<td></td>
</tr>
<tr>
<td>4&lt;sup&gt;th&lt;/sup&gt;-8&lt;sup&gt;th&lt;/sup&gt; dynasties</td>
<td>ca. 2575-2150 BC</td>
</tr>
<tr>
<td><strong>First Intermediate Period</strong></td>
<td></td>
</tr>
<tr>
<td>9&lt;sup&gt;th&lt;/sup&gt;-11&lt;sup&gt;th&lt;/sup&gt; dynasties</td>
<td>ca. 2150-1980 BC</td>
</tr>
<tr>
<td><strong>Middle Kingdom</strong></td>
<td></td>
</tr>
<tr>
<td>11&lt;sup&gt;th&lt;/sup&gt;-13&lt;sup&gt;th&lt;/sup&gt; dynasties</td>
<td>ca. 1980-1630 BC</td>
</tr>
<tr>
<td><strong>Second Intermediate Period</strong></td>
<td></td>
</tr>
<tr>
<td>14&lt;sup&gt;th&lt;/sup&gt;-17&lt;sup&gt;th&lt;/sup&gt; dynasties</td>
<td>ca. 1630-1520 BC</td>
</tr>
<tr>
<td><strong>New Kingdom</strong></td>
<td></td>
</tr>
<tr>
<td>18&lt;sup&gt;th&lt;/sup&gt;-20&lt;sup&gt;th&lt;/sup&gt; dynasties</td>
<td>ca. 1540-1070 BC</td>
</tr>
<tr>
<td><strong>Third Intermediate Period</strong></td>
<td></td>
</tr>
<tr>
<td>21&lt;sup&gt;st&lt;/sup&gt;-25&lt;sup&gt;th&lt;/sup&gt; dynasties</td>
<td>ca. 1070-715 BC</td>
</tr>
</tbody>
</table>
**Late Period**

25\(^{th}\)- 30\(^{th}\) dynasties  
ca. 715-332 BC

**Second Persian Period (31\(^{st}\) dynasty)**

Macedonian Period  
332-305 BC

Ptolemaic Period  
305-30 BC

Roman Period  
30 BC-AD 395

Byzantine Period  
AD 395-640

Muslim Rule  
AD 640

Formation of the Mamluk dynasty  
AD 1250

Egypt is conquered by the Ottomans  
AD 1517

Egypt is conquered by the French under Napoleon Bonaparte  
AD 1798

Egypt is controlled by British troops  
AD 1882

Egypt becomes a British protectorate  
AD 1918

Egypt gains independence under King Fuad I  
AD 1922

Overthrow of the monarchy by a military coup led by the Free Officers Movement  
AD 1952
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